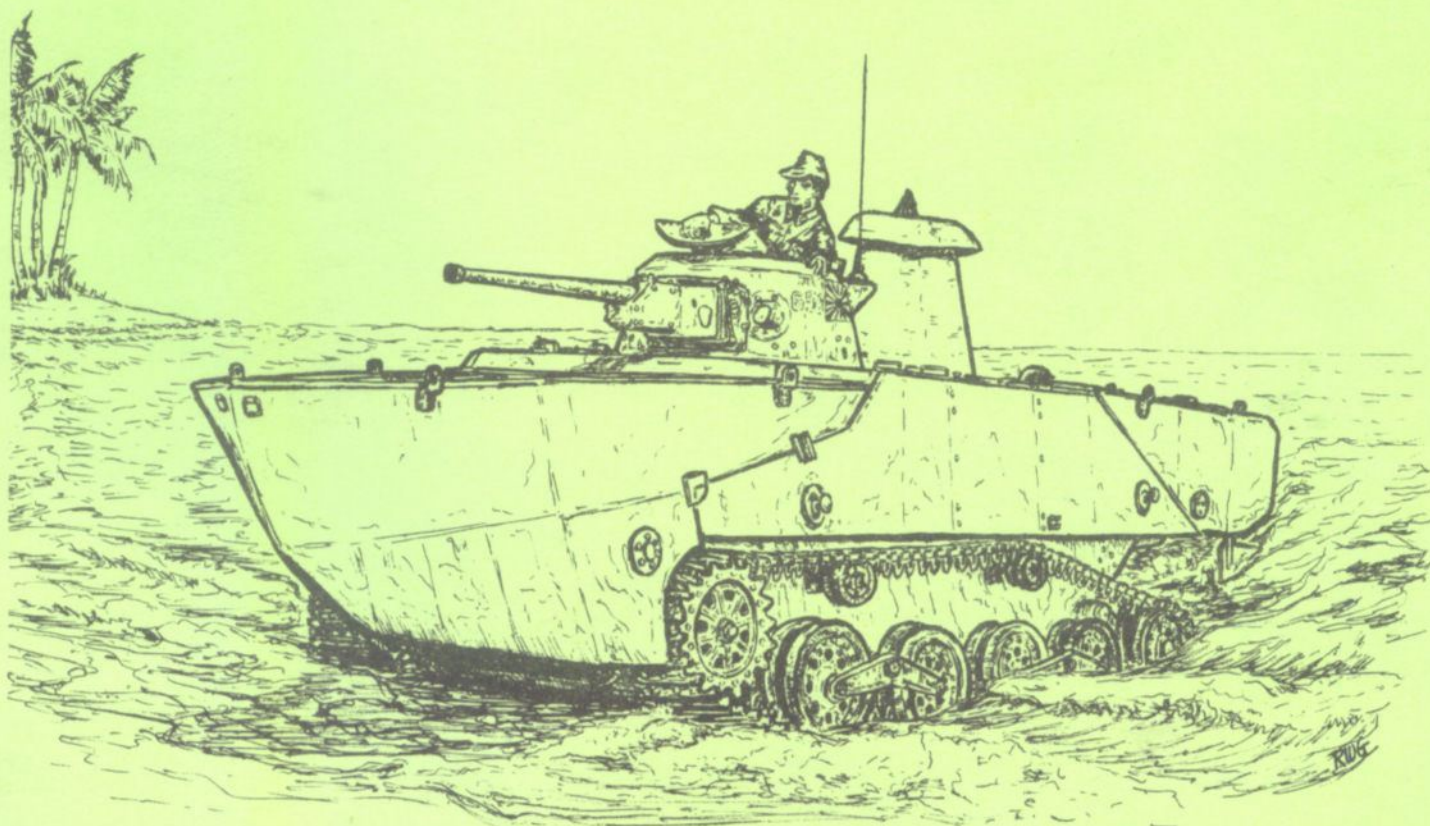




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Volume 3 Number 8



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Continuing in this Issue, AFV-G2 is presenting the first complete illustrated History of the Armored Fighting Vehicles of the Italian Army. Authored by Dr. Nicola Pignato, a widely-known historian on the Italian Armed Forces, this serialized book is available only to readers of AFV-G2. This issue's supplemental sheets will be found at the center of the magazine, between pages 16 and 17; they are designed for easy removal and binding together in a separate binder. When collated together, the separate supplemental sections from AFV-G2 will form a detailed history of all Italian Armored Vehicles, with many previously unpublished photographs and 1:50th scale drawings, including new material on the colors and camouflage used by the Italian Army. To remove the center supplemental sheet in this issue, use a razor blade or sharp knife to slit between the staple holes in the sheet, which will then be free of the magazine. Readers may then punch the sheet with a three-ring binder punch, and place it in a binder with the other supplemental sheets to be published with every issue of AFV-G2. The sheets are separately numbered in consecutive order for easy binding and each set of supplemental sheets will contain a chapter or section of the complete book. At the end of the run, a complete index and a table of contents will also be furnished to readers to complete the book.



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COVER: Coming out of the surf onto an islet, a Japanese "Ka-Mi" amphibious tank commander opens his hatch to get his bearings. The "Ka-Mi" was a most unusual vehicle, which is illustrated in more detail on Page 15. Our cover pen-and-ink drawing is by R. W. Garbisch.

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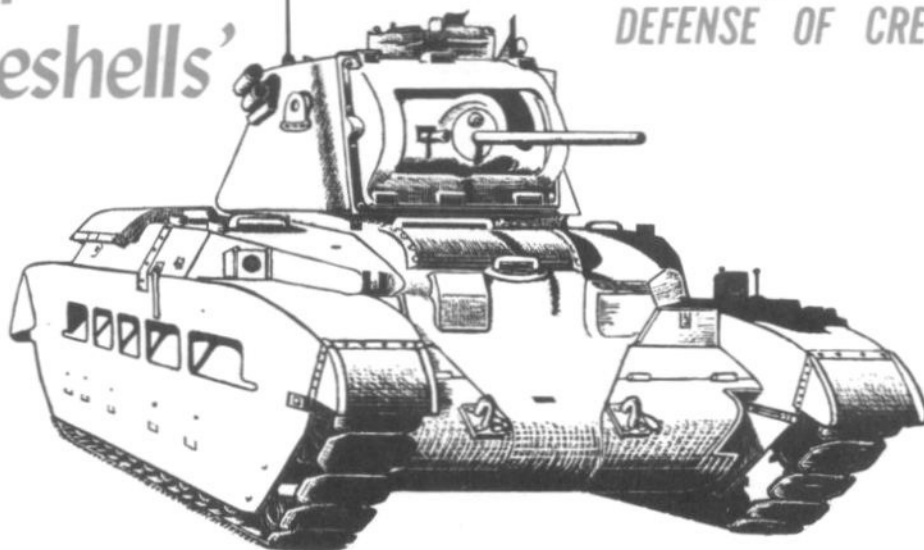
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'Battered Hulks and Cockleshells'

BRITISH ARMOUR IN THE DEFENSE OF CRETE



Part Two

by William E. Platz

IV. Retimo - Preparations

"...you have done magnificently."

Maj. Gen. Freyburg to Lt. Col. Campbell

On May 16th, 1941, a German reconnaissance plane crashed near the improvised landing ground five miles east of the fishing village of Retimo. In the wreckage was an aerial photograph taken a few days previously, of the Australian defense positions in the area. For the Australians this was good news - only one of their emplacements had been spotted; but, for the thousand officers and men of Fallschirmjäger-Regiment 2, the failure of their reconnaissance was to prove fatal.

At Retimo, the airfield consisted of a single runway, parallel to the beach, dominated by a low ridge to the south. The entire coastal plain was less than a quarter mile wide and in some spots outcrops of rock came to within 100 yards of the sea. This ridge was cut by a series of gullies running towards the coast, which divided it into a series of low hills. These hills formed the backbone of the defense.

The coastline from Suda Bay to Retimo airfield was the responsibility of Brigadier Vassey's 19th Australian Brigade. These were the same desert veterans who had wrested Bardia and Tobruk from the italians, however, now their task would be much more trying. Vassey had four regular infantry battalions but it was soon apparent that these would be too widely separated for effective control. He therefore placed the two battalions at Retimo under the command of Lt. Col. Campbell as an independent and somewhat isolated force. In addition to his own 2/1st Battalion, Campbell was given Major Sandoover's 2/11th Battalion, a battery of improvised artillery and Lieut. Simpson's Troop of two "Matildas" from "B" Squadron, 7th RTR. There were also 3,100 Greek and Cretan troops in the area, armed with a collection of American, Greek and French small arms and with less than ten rounds of ammunition per man. Heavy weapons were also in short supply.

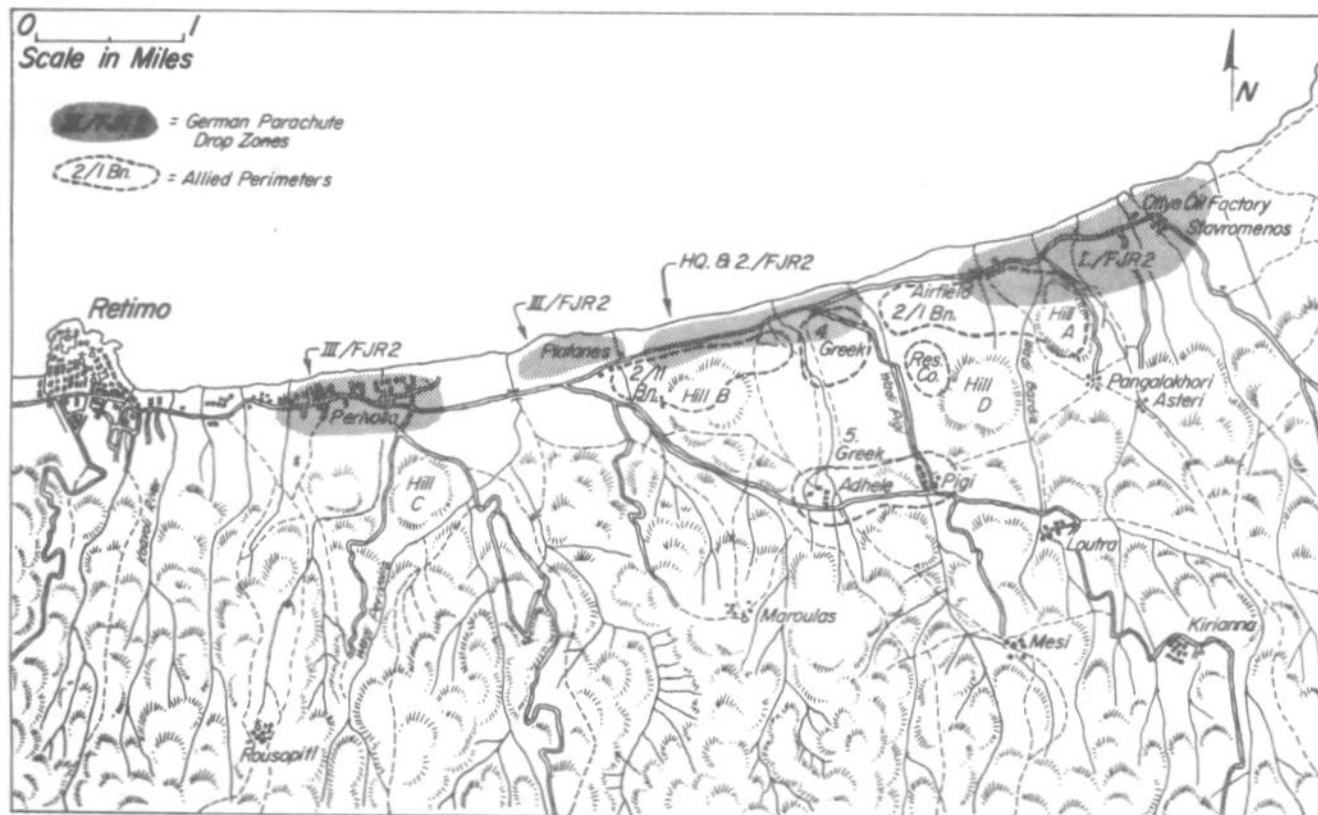
Defense of the landing ground was Campbell's primary objective and his dispositions were made accordingly. The infantry and guns (four 100mm Italian and four 75mm French) were sited on the hills where they could dominate the landing ground. Simpson's two tanks were held in reserve behind the ridge line in the "Wadi Pigi", which opened onto the plain a short distance west of the field. Here they were concealed under the olive trees along with a company of the 2/11th Battalion. The Greek battalions held the town itself, and the rear and flanks of Campbell's Australians.

V. Retimo - The Attack

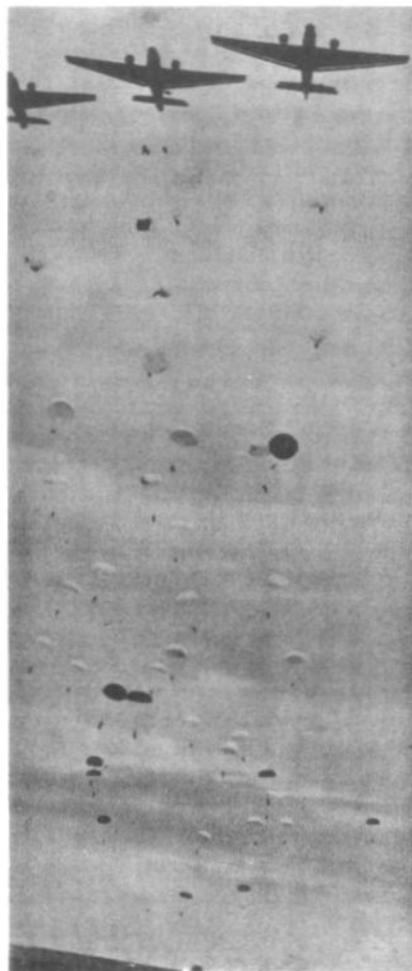
At 0900 hours on May 20th, fourteen JU-52 transport aircraft were sighted over Retimo, heading west towards Canea. The attack had come. Final preparations continued but it was not until 1600 hours that afternoon that German aircraft directed their attention to the Retimo defenses. Then for fifteen minutes, fighters and dive-bombers sprinkled the area with bombs and bullets, doing little damage to the well-hidden defenders. There was no question of defensive fire since there was not a single anti-aircraft weapon in Campbell's entire command! As the bombers retired, the first group of transports - twenty-four JU-52's - arrived from the northeast, turned parallel to the coast, and began dropping parachutists along the narrow beaches from Stavromenos to Perivolía. The big tri-motor Junkers flew at 400 feet and were less than a hundred yards from the Australian trenches. It was a golden opportunity and the Aussies made the most of it. All along the ridge line, rifles and Bren guns opened fire. For 35 minutes, the "skeet shoot" continued. 161 aircraft ran the gauntlet; seven were brought down, crashing near the village of Perivolía.

The German assault force consisted of the main body of Oberst (Colonel) Sturm's Fallschirmjäger-Regiment 2 (I. Abteilung, III. Abteilung and the Stabs-Kompanie). East of the airfield, Major Koch's I. Abteilung was scattered over a wide area - some men landing right on top of the Australian positions on Hill A (see map). Further west, Sturm's HQ, escorted by the 2. Kompanie (of I. Abteilung), dropped close to the landing ground, and the III. Abteilung landed between the airfield and Perivolía. Casualties were heavy during the initial drop. The HQ group was wiped out while in the air, and Sturm himself was captured. The III. Abteilung formed a defensive "hedgehog" around Perivolía. Only in the east, the Germans held vital ground - Hill A - where Koch's battalion clung to the northern and eastern slopes.

Behind the ridge line among the olive trees, Lieut. Simpson listened to the rattle of small arms fire build steadily. Some thirty minutes after the first parachutes were sighted, the word came.... "Counterattack". Simpson's two Matildas pulled-out from the olive grove and clanked their way down the road toward the airfield. As the tanks emerged from the Wadi and moved across the level area of the landing ground, they were peppered with small arms fire from isolated groups of paratroopers. Besa machine guns chattering, the two Matildas lumbered on. 100 yards from the beach, Simpson turned eastwards. Then it happened! As Simpson's tank crossed the culvert over the drainage ditch along the seaward edge of the runway, it "bellied-out" and became firmly lodged



VICINITY OF RETIMO - MAY 20, 1941



in the ditch. Simpson climbed out of the turret, but was cut down and killed by a burst of automatic weapons fire. The rest of his crew were captured after dark. The second Matilda continued eastwards engaging the Germans on the northern slopes of "Hill A" with machine guns. Pushing further, however, it too fell victim to the broken ground. With the hatches closed against the splattering small arms fire, the driver blundered into an eight-foot deep gully. This crew too was captured, but the Germans were unable to retrieve the stranded Matildas.

The failure of Simpson's counterattack did not mark the end of the story of tanks at Retimo, however. After a long night of fierce and determined fighting, Campbell gathered his last reserves together and in a series of sea-saw battles finally drove the remnants of Major Koch's battalion off Hill A and back to the Olive-oil factory at Stavromenos. The following day, he turned his attention to the isolated paratroopers sheltering on the coastal plain between Hills A and B. Among the latter was the German commander, Oberst Sturm, who was captured along with his operation orders. As a result of these operations, Campbell also regained control of the two stranded tanks. Lieut. Mason of the Royal Army Ordnance Corps took charge of the recovery operations using the men from the 2/1st Battalion's Carrier Platoon. German aircraft hampered their efforts, however, by dawn of the 24th, Mason had managed to man-handle Simpson's tank out of the drainage ditch and train a crew for it from among the Australians.

Campbell immediately employed the resuscitated Matilda in a reconnaissance towards the Olive-oil factory. As the tank approached, the startled Germans dove for cover in the thick stone-walled out buildings. These buildings proved to be secure against the shot from the Matilda's 2-pounder, so little was accomplished other than to keep the Germans pinned-down.

That night, the tank was shifted to the western front and placed under command of Major Sandover's 2/11th Battalion. Here the remnants of Weidemann's III. Abteilung had fortified themselves in-

to the stone houses of Perivolía and St. George's Church. It would take a tank to get them out and the tank arrived at first light of the 25th. As the Matilda lumbered forward, an aircraft was spotted overhead. The driver, accustomed to a Bren Carrier, miscalculated and the entire Australian armoured attack charged off a culvert and into a creek. Stuck again! Quickly the assault was cancelled and the bogged tank camouflaged. During the day, the presence of German bombers kept the recovery personnel under cover, but after darkness fell, the Matilda was dragged from the stream bed. By dawn, the tank was ready to try again.

As the sun rose on May 26th, Sandover prepared to attack once more. The objective was St. George's Church, a German strongpoint southeast of Perivolía. Lieut. G. J. Greenway was in the turret of the Matilda as it closed on the German position. Shell bursts erupted around the tank as the Germans opened-up with mortar and anti-tank fire. Suddenly, a terrific clang hit the armoured turret and the concussion of an exploding shell shook the vehicle. The projectile failed to penetrate but the impact jammed the turret and stunned Lt. Greenway who fell unconscious to the turret floor. The driver brought his damaged vehicle out of action and the infantry, unable to make any impression on the thick stone walls, again called-off the attack.

Meanwhile, Mason's recovery crews were working on salvaging the second tank from its resting place in the gully. By the morning of the 26th, it too was in action. At 0900, Campbell launched an attack on the Stavromenos factory, supported by his 75mm guns and the Matilda. The Australians rushed the factory and took it, only to learn that the last 30 Germans had withdrawn to the east. Nevertheless, 82 paratroopers had been captured at the factory, bringing Campbell's total of prisoners to over 500.

With his eastern flank secured, Campbell now turned his full attention to the capture of Perivolía. A third attack was planned for the morning of the 27th, and this time both tanks were made available. The armour was to support two companies of Australian infantry. The infantry had infiltrated during the night to within 75 yards of the German lines. As the sun rose, the two Matilda tanks arrived and advanced toward the line of houses that marked the outskirts of the town and the

- Continued on Page 30 -

BEHIND THE ARMOR VERSUS SHOT CONFRONTATION

by Mark Diehl

Since the advent of armored vehicles in modern warfare, military researchers have been engaged in their own battles to develop better armor and more efficient armor penetrating projectiles. The technology behind this area of weapons development is well beyond understanding for someone who does not have advanced training in physics or mechanical engineering. Unfortunately, this includes most AFV enthusiasts. The objective of this article is to remedy this situation..... to present some of the most deciding factors of the armor versus shot confrontation in terms the average layman can understand. In doing so, a few scientific heresies may be committed (such as using mass and weight terms interchangeably) and the indulgence of our more scientifically oriented readers is requested.

In getting to the matter at hand, the instant a projectile contacts an armor plate, seven major factors determine if penetration will occur. Factors which increase penetration are projectile weight, speed and quality. Factors that decrease penetration are projectile diameter, armor thickness, angle of strike and armor quality.

WEAPON	WEIGHT - AP SHOT	MUZZLE VELOCITY	PENETRATION at 500 meters
Soviet 76.2mm, L-41.2	6.3 Kg.	662 m/sec.	69mm
Soviet 85mm, L-51.5	9.2 Kg.	792 m/sec.	111 mm

TABLE I.

The reasoning behind several of these factors is obvious and needs only simple review. Projectile speed and weight combine, producing the force that acts on the armor. Increasing either, or better yet, both, increases penetration. For example, two World War II. Soviet tank weapons, the 76.2mm 41.2 caliber and the 85mm 51.5 caliber had the characteristics listed in Table I.....the 85mm is a much more

effective weapon. It is also logical that if one increases the armor thickness against the Soviet 76.2mm L41.2 to 75mm or 80mm, penetration at 500 meters will not occur.

The angle of strike is not that simple. Over its entire range, it acts to increase EFFECTIVE armor thickness, but at large angles it acts to deflect the projectile. Simple trigonometry produces the relationship between effective armor thickness and angle of strike, as shown in Figure I. When deflection is concerned, the shape of the projectile (and any in-flight wobble it may have) must be taken into account. Most projectiles have shapes called Ogives, referring to their overall curve. If the projectile hits the target in such a way that the point-of-shot is not the first part to make contact, the shot will quite possibly glance off. Figure II shows two examples, the arrows indicate the probable future path of the shot.

Compared to the factors already discussed, the projectile diameter, or more properly, the diameter of the hole to be punched out of the armor, is relatively minor. Its effect is similar to what a carpenter finds when he tries to drive a 1/4-inch diameter nail and an 1/8-inch diameter nail into a piece of wood with the same hammer. The thicker nail naturally takes more effort to penetrate. In ordnance, to keep good ballistic properties, an increase in diameter means a much greater increase in volume. This volume increase gives a proportionate increase in weight. For example, the WWII. German 75mm AP Shot was slightly over twice the diameter of their 37mm AP Shot, but the weight increase was tenfold: 6.8kg for the 75 mm and 0.68kg for the 37mm. Also to be remembered is that an increase in shot diameter means an increase in the amount of propellant

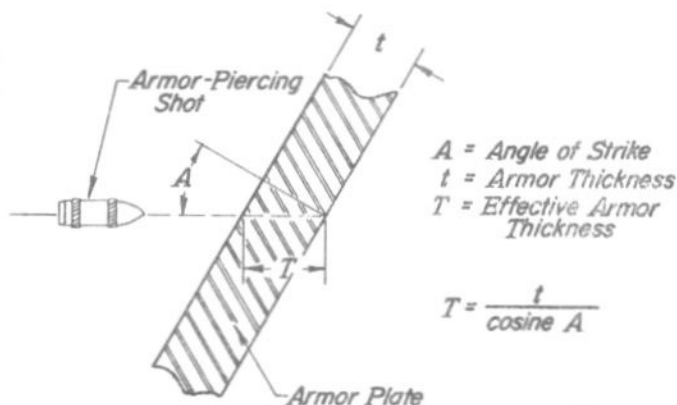
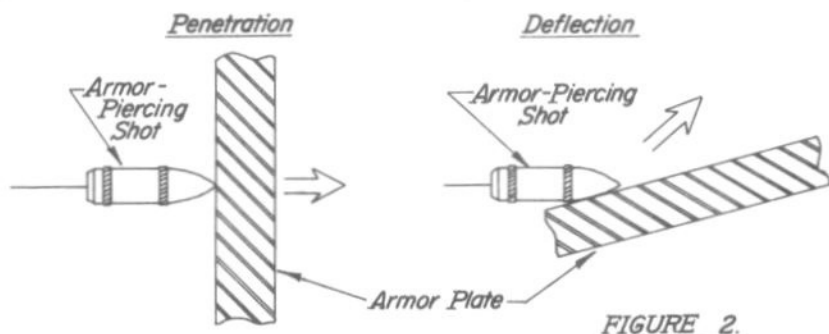


FIGURE I.

available. This usually increases projectile speed. The fact that shot diameter increase is over-compensated by speed and weight increases just means that our friend, the carpenter, will get to use a much larger hammer.

To evaluate the two remaining factors, projectile and armor quality, we will have to take a look at what happens when shot meets armor. The first property of metal to play its role is that of hardness. A harder material will dent a softer one, with the depth of the dent directly related to the difference in hardness of the two materials. If the projectile is harder than the armor, the armor is



dedented; likewise, if the projectile is softer, it is dented.....the point is blunted. If both are of about the same hardness, both are dented or deformed.

With contact made, a peculiar property of physics takes over: Conservation of Momentum (what makes recoil occur). This means a shot weighing a few pounds and moving at several thousand feet per second upon meeting a tank weighing many tons will

transfer energy and the tank will recoil slightly. This small recoil causes an extreme deceleration of the projectile. The deceleration coupled with projectile weight produces a compressive force within the shot - the focus of this force, the place where it acts, is the area where the projectile and armor touch. When this area is small, the compressive forces are relatively high and will cause the shot to disintegrate, IF the compressive strength of the projectile material is exceeded. By keeping armor very hard, indentation is kept low, contact area is reduced, compressive forces become relatively high and the shot tends to break up.

If the armor is much softer than the projectile, indentation is greater and the contact area larger. Compressive forces are kept low resulting in the shot remaining whole. Now, as compressive forces build, they are transferred across the contact area to the armor. With this transfer, compressive force becomes an impact force. A property of the armor plate called impact strength comes into play. Any material will absorb some amount of force upon impact. If this force limit is exceeded, the material breaks down or fractures....the force needed to cause this breakdown is called impact strength. Table II. shows nine possibilities of the shot/armor contest; the outcome is

TABLE II.

KEY		ARMOR IMPACT STRENGTH versus SHOT COMPRESSIVE STRENGTH		
CASE NUMBER	PICTORIAL DESCRIPTION	ARMOR greater than SHOT	ARMOR equal to SHOT	ARMOR less than SHOT
VERBAL DESCRIPTION				
ARMOR HARDNESS versus SHOT HARDNESS	ARMOR greater than SHOT	CASE 1 ✓ Desintegration ✓ No Indentation ✓ Fragments Recoil	CASE 2 ✓ Desintegration ✓ No Indentation ✓ Fragments will not Penetrate	CASE 3 ✓ Desintegration ✓ No Indentation ✓ Fragments may Penetrate
	ARMOR equal to SHOT	CASE 4 ✓ Indentation ✓ Shot Deformation ✓ No Penetration	CASE 5 ✓ Shot Deforms ✓ May Punch-out Armor Plug, but ✓ No Penetration	CASE 6 ✓ Shot Deforms ✓ PENETRATION
	ARMOR less than SHOT	CASE 7 ✓ Indentation ✓ Shot Deformation ✓ Penetration Unlikely	CASE 8 ✓ PENETRATION ✓ Armor Breaks-up into many Small Fragments	CASE 9 ✓ PENETRATION ✓ Armor Breaks-up into many Large Fragments

related to the ratios of shot/armor hardness and shot compressive strength/armor impact strength. Examples of typical cases in Table II. are common battlefield occurrences. Case 1 represents the impact of a small arms round on armor plate. The large amount of energy transfer that takes place causes the round to become very hot....in fact, the glowing trail of round fragments or ricocheting rounds is often seen at night. In case 3, the round fragments retain force enough to overcome armor impact strength. Such is the penetration using an anti-tank rifle in sub-zero temperatures when armor is exceptionally brittle. In cases 2, 4 and 7 the energy used in deforming shot and armor produces enough heat to melt portions of each. This molten metal is referred to as splash. Where bolted or rivetted armor is used, splash can be as lethal as a penetrating shot. The shot in case 7 will usually remain imbedded while only fragments remain in the other two cases. Cases 5 and 6 occur mostly when the same or similar metals are used for both armor and shot. Cases 8 and 9 are good battlefield penetrations; case 9 being against exceptionally poor quality armor. It is important to remember that the other five factors already presented in this article are used to greatly modify the results shown in Table II.....the table is only a guide, not the rule.

Back in the times when armor implied warships, a term known as "Figure of Merit" was introduced. Figure of Merit is a number given to rate qualities of various armor materials. For the terms we are considering, armor with a high Figure of Merit would be found in case 1, with a high impact strength and high degree of hardness. Likewise, a low Figure of Merit is illustrated in case 9. Apparently, making both impact strength and hardness as high as possible is the key. But, it is not quite that simple.

As metals become harder, they also become more brittle. Brittleness destroys the property of impact strength. What needs to be done is to find a suitable combination of the two. Let's see what armor researchers have done over the years to develop better combinations of these properties, attempting to reach a higher Figure of Merit.

These researchers use metallurgical tests to evaluate armor materials. The key to good testing is uniformity - all samples must have the same dimensions and undergo the same conditions. Results of impact strength (and compressive strength for projectiles) is measured in Foot-Pounds and is the actual energy needed to punch through a sample. Hardness is evaluated by the Brinell Hardness Number (among many others) and is determined by the size and depth of a dent made in the sample. A very elementary Figure of Merit is produced by multiplying these values together. Table III. shows a list of some irons and steels which may have been considered for early armor. As we see, wrought iron is the absolute worst choice for armor plate, while the best choice would be class 105,000 alloy steel. This steel shall be our yardstick to measure other materials.

What would happen if we did our own testing? If we were to fire shot at a plate made from wrought iron, case 9 of Table II. would occur; using class 65,000 cast carbon steel, case 5 or 6 may result, and using class 200,000 alloy steel, case 3 would take place. The best penetration resistance comes with the class 105,000 alloy steel. Tests like this caused armor metallurgists to change from steam boiler plate found on early tanks to a good quality alloy steel.

This steel, as in all the other samples, had its properties of strength and hardness present uniformly through its depth. In the mid-1930's, new process techniques were developed in hopes of increasing both impact strength and hardness. The first major development was an adaption of well known heat treating processes. Tempering and annealing through various high temperature heating cycles with rapid cooling in oil increases strength with not too great a loss in hardness. The average increase in Figure of Merit is about 20%. However, heat treatments demand more extensive machining and assembly steps. Also, different welding methods are needed to keep from destroying the improved metal properties.

TABLE III.

METAL	HARD- NESS	IMPACT STRENGTH	PRODUCT	FIGURE of MERIT*
Cast Iron	130	70	9100	.72
Annealed Wrought Iron	69	19	1311	.13
Alloy Steel - Class 105,000 Class 200,000	217 401	58 14	12586 5614	1.00 .45
Cast Carbon Steel Class 65,000	131	35	4585	.37
Carbon Steel Class 100,000	212	40	8480	.67

* Ratio of a metal product to a standard product - in our case, Class 105,000 Alloy Steel

- Continued on Page 29 -



ARMOR in VIETNAM

The M-42 SP AA Gun

- 11 -

The photographs on this and the opposite page show M-42A1 "Duster" Anti-aircraft Gun Vehicles in use in South Vietnam. The vehicles in the photos are from "C" Battery of the 5th Automatic Anti-aircraft Weapons Battalion of the 2nd Artillery, a unit assigned to the II. Field Force during the 1967-68 period. II. Field Force operated in the area north and west of Saigon.

Until the advent of the Vietnam war, the M-42 "Duster" was considered obsolete to the needs of the U.S. Army; aircraft were too fast to be "tracked" by the M-42 and it lacked radar gun direction to enable the weapons to engage targets coming from "over the horizon". The surplus vehicles had been put into "moth-ball" storage at Fort Bliss, Texas, until the Vietnam conflict brought another use for these vehicles into focus.

In Vietnam, the M-42A1 "Duster" is used for convoy protection and escort, or for fire support base protection. The two photographs on the opposite page illustrate a vehicle in the former role, while the photo below shows a vehicle firing at a zone of suspected enemy attack. The M-42A1 differs from the earlier M-42 by having a diesel power plant, and vehicles in Vietnam have added armor and a 7.62mm M-60 machine gun mounted on a pedestal near the gunner's position. In the photo below, the vehicle is shown backed into a rivetted position, and the entire crew (less the seated gunner) is passing ammunition to keep the twin 40mm guns firing. Note the four-round clips of HE shells and the lack of armor protection for the crew members loading the guns.



Modeling the Hanomag

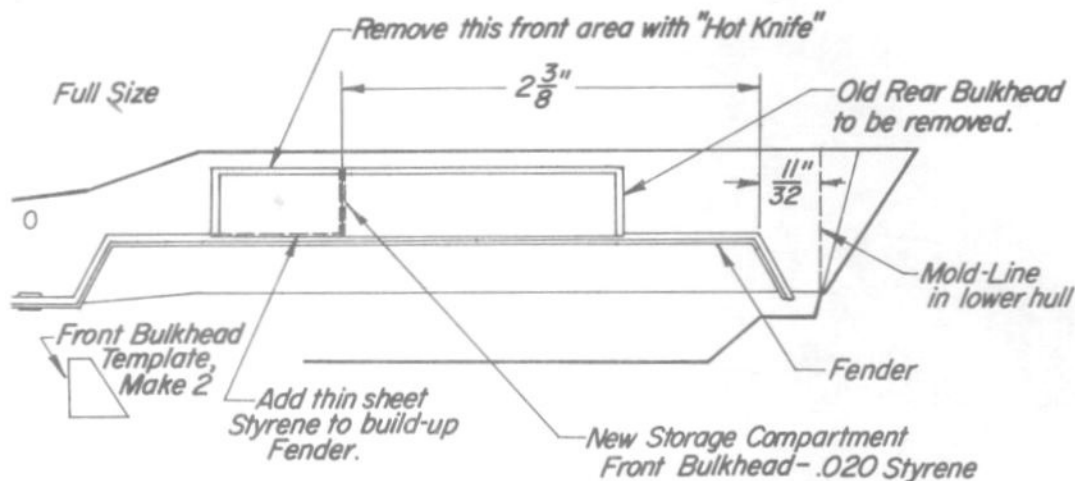
Sd. Kfz. 251/7 Engineer Vehicle

by James Steuard

The Hanomag Sd.Kfz.251/7 was an Armored Engineering Vehicle designed to carry two small "ditching" bridge sections which could be used to bridge-over small streams or gullies, or to act as ramps to cross anti-tank ditches or high stream banks. Most of these vehicles appear to have been converted from the basic infantry Sd. Kfz. 251/1, utilizing either the Ausführung C or the later Ausführung D. This modeling conversion is based on the Nitto 1:35th (actually 1:33.5) model of the Sd. Kfz. 251/1, Ausführung B, and like the original, it's a fairly easy conversion.

For the basic conversion of the Nitto kit to the mid-war Ausführung C, the reader is referred to AFV-G2, Vol. 3, No. 3, pages 14-16. The earlier article covered all of the basic hull modifications made to the standard armored infantry carrier version.

After you have modified the Nitto kit per the above reference article, it's time to start on our engineering vehicle. The first alteration will be to the side storage boxes on the lower hull; these were moved rearward on the "251/7". Use the full-scale drawing below to provide dimensions and make cutting lines on the storage boxes on the kit's lower hull. Please note that the vertical "mold line" at the rear of the hull is used as a reference line, from which to start measuring. First, I marked lines for the removal of the front section of the storage boxes. The front sections on both sides are to be removed and a new end plate will then close the box. You can use a Razor-Saw to make the cuts, although I had much better control using Xacto's new "Hot Knife", which cuts styrene like a knife through Jello. The "Hot Knife" gives a cleaner cut with fewer scratches and seems to leave a lot less sanding to be done. After you have removed the front of both boxes, you can cut off

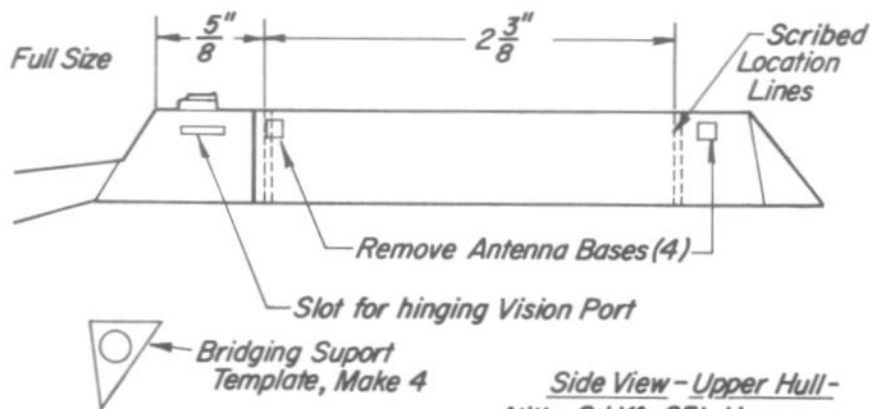


Side View - Lower Hull- Nitto Sd.Kfz.251 Hanomag Halftrack

the rear of the boxes, if desired. After a little sanding, you're now ready to build the new boxes. Use the template to make a new front plate from .010 styrene and glue it in place. Next, use a piece of thin scrap to build-up the fender where the old front of the box had been. A little putty after dry, and the fender will look as if it had never been molded thinner. Next, use fairly thick (.015) styrene to make a new rear section on the storage boxes. Be sure to make this new section the right length so that the overall length of the box will be 2-3/8". This allows the use of the original storage box doors as provided in the kit. After you've finished the boxes and installed the doors, set the lower hull aside to dry thoroughly.

Moving on to the kit's upper hull, use the full scale drawings on the opposite page to mark lines for the location of the Bridging Supports. Please note that the measurements are started from the front corner of the upper superstructure. Draw vertical lines on the sides of the hull, or place scribed lines in the proper places. Next, I cut thin strips of .010 (or thinner) styrene, making the width of these strips a little over 1/16". Cut four strips to the proper length so they will exactly fit on the inward slant of the upper hull, and then cement them over the lines you've drawn. These strips will act as the inner stiffening braces for the Bridging Supports, which we make next.

Using the template in the drawing at the right, make four Bridging Supports from .010 styrene. The hole in the center of each support should be approximately $5/32$ " in diameter. After cleaning-up and sanding the four supports, cement them to the strips on the upper hull. Be sure that the supports are glued so that the top edge is horizontal and the outside edge slants gently outward, and also so that they are centered on the thin strips glued to the hull sides. Now, set the upper hull aside to dry.

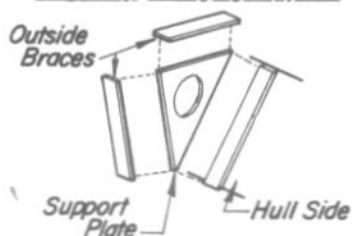


*Side View - Upper Hull -
Nitto Sd.Kfz.251 Hanomag*

When the hull and supports are dry, cement two more of the narrow strips to each support to form the outside bracing that was used to stiffen the supports. If done correctly, the edges of the strips should meet in a good joint at the corners of the supports; see the sketch below for details.

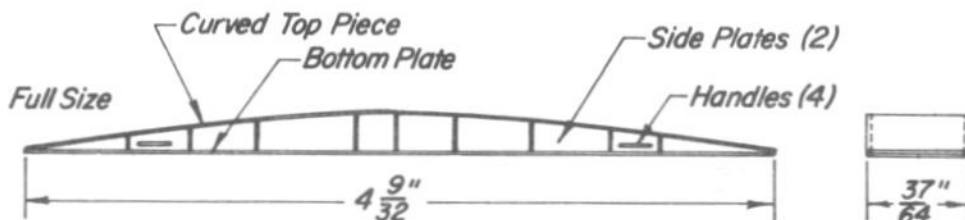
The next part of our conversion is the construction of the Bridge Sections. These can be easily made with a little patience. Start with a rectangle of thin sheet styrene (.005 perhaps) that measures $37/64$ " wide and $4-9/32$ " long. This piece, as all other parts of the Bridges, should be made from thinner stock to remain in scale. The above described piece will be the base of each

Assembly - Bridging Support



Bridge Section. Now, cut the sides from the same thin styrene material; you can use the full-scale drawings at the base of the page as a template, if desired. Be sure to use the "inside" lines on the drawing, to keep the bridge from becoming too thick. The top of the sides should have a gentle, regular curve, with no dips or bulges in it, so that the curved top will fit closely. When you have manufactured the correct number of sides (four will be needed to make both bridges), they can be cemented to the flat bases, slightly inside of the edges. Be sure the sides fit so that there is this slight "inset"; refer to the end-view (below) which shows the correct locations of the sides as dotted-lines. After cementing the sides down, I used small blocks of styrene, cut to fit inside (and between) the sides to act as "braces" or "jigs"; these will assist in holding the sides vertical. Take your time in assembling these parts so as to get them exactly right. When thoroughly dried, we can go on to the curved top of each bridging section.

In making the curved top, I used hot, almost boiling water to soften the styrene so that it could be curved over the upper edge of the sides. I would suggest testing (and determining) the temperature of the hot liquid with a small piece of scrap styrene of the correct thickness (and perhaps using a "candy" thermometer to measure the water temperature); when the plastic just starts to soften and bend, the water is at the right temperature. The thin styrene for the top should measure $37/64$ " wide and $4-3/8$ " long before heating. I cut my pieces slightly longer and then sanded them to fit after assembly, but this is not absolutely necessary. When you have the cut pieces ready, dip them in the hot water, one at a time, holding them with a pair of pliers to avoid burns. When the plastic softens, move it over the assembled base and sides and hold it curved against them until cooled and "set". After cooled, the now curved top can be cemented down to complete the Bridge Sections. You can add the stiffening strips running vertically between the top and base and also the four handles to carry the Bridge Sections. I used



Bridge Section - Nitto Hanomag Sd.Kfz.251/7 Conversion

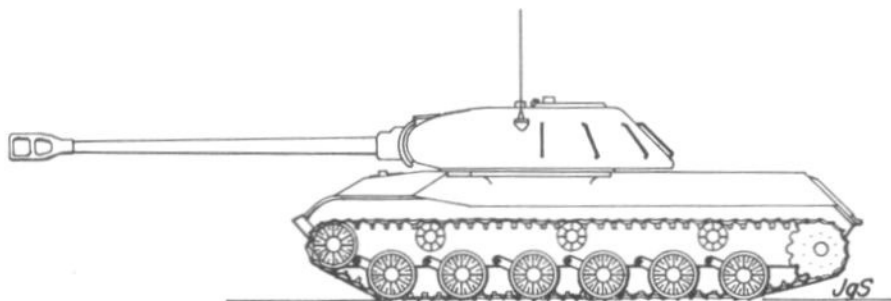
- Continued on Page 29 -

ARMOR G-2

Current Data on the World's Armored Forces.

Armor of the Warsaw Pact

by J. C. Johns



JS-III. Heavy Tank

ROUMANIA

Strength of Army: 130,000
Term of Service: Sixteen Months

Armored Equipment:

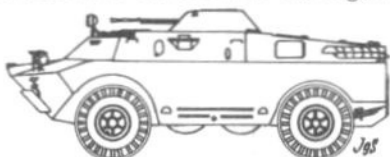
A few JS-III. and T-10 Heavy Tanks; 1700 Medium Tanks, mostly T-54 and T-34/85 types with some T-55 and T-62 tanks About 900 BTR-40P Rec-

onnaissance Vehicles, BTR-50P and BTR-152 Armored Personnel Carriers.

Artillery: SU-100 and JSU-122 Self-propelled Guns; about 75 Frog Surface-to-Surface Missiles; standard 76mm, 122mm and 152mm artillery pieces (towed), 57mm M-1943 and M-1955, 85mm M-1945 and 100mm M-1955 anti-tank guns; "Snapper", "Swatter" and "Sagger" (NATO designations) guided anti-tank missiles, some mounted on BTR-40 armored cars.

Anti-aircraft Artillery: 37mm, 57mm and 100mm anti-aircraft guns (the latter is radar directed), as well as SAM-2 Surface-to-Air guided missiles.

The above equipment is used to form two Tank Divisions, seven Motorized Rifle Divisions, one Mountain Brigade and one Airborne Regiment. All of these units are at approximately 90% of established or authorized strength.



BTR-40PB Armored Car

Roumanian para-military forces number approximately 40,000, including Border Troops and police units manning the frontier outposts. A militia of approximately 500,000 is also in existence, although no information is available as to state of training or equipment of this force (although it is certain to include "obsolete" or older small weapons).

The Japanese 'Ka-Mi' Type 2 Amphibious Tank

by Steven Cobb

The Japanese Type 2 "Ka-Mi" Amphibious Tank was based closely on the Type 95 Tank, but with a new hull and turret. The Type 2 had the same suspension as the Type 95, except for drain holes in the road wheels and concealed helical-coil suspension springs. Both suspensions were actually based on the British Carden-Lloyd system. Other qualities, such as the track, engine and the mechanical components of the Type 2 were similar to those of the Type 95 tank, however, the main armament was of an improved type.

The turret was constructed of rolled armor plate, with an all-around thickness of 0.52-inch; this turret was similar to that of the Japanese Type 98 Light Tank, with an armament of one 37mm gun and one 7.7mm machine gun, which was mounted coaxially with the main gun. This coaxial mount was an innovation in Japanese tanks. There was a second 7.7mm machine gun mounted in the hull designed to fire in a forward direction.

The hull was increased in volume and size from the Type 95, in that the sides ran the full width of the vehicle. This increase allowed for a crew of five to be carried; this crew consisted of a Commander and Gunner in the turret, a Driver and a Hull Machine Gunner in the front of the hull, and a Mechanic who was responsible for power transfer and engine maintenance, stationed in the hull near the engine of the tank. The hull was constructed of rolled armor plate, 8mm to 12mm in thickness; this was bolted and riveted together. The engine location was the same as in the Type 95 except for working space provided around the power plant for the mechanic. Drive in the water was furnished through two propeller shafts, one on each side of the hull, driven through a power-takeoff arrangement. Engagement for water travel was made through a handwheel on the power-takeoff transfer casing; there was one handwheel for each propeller. This transfer case also contained a built-in bilge pump for clearing water seepage from the lower part of the hull.

For amphibious operations, flotation was effected by two pontoons, one fore and the other aft. These pontoons were constructed from 1/8-inch mild steel plate. The bow pontoon weighed 2300 pounds and was divided into six compartments, with a total approximate volume of 220 cubic feet. The stern pontoon weighed 1515 pounds and it was divided into five compartments with an approximate volume of 105 cubic feet. These were held in place by clamps on the front and rear edges of the hull; they could be released from inside of the tank by the operation of handwheels at the Tank Commander's position in the turret. The Commander also controlled the direction of the tank in water through operation of the rudder by a system of cables. These cables were released before the pontoons were jettisoned. Also for use when afloat, an engine air duct was fitted over the cooling grill on the top of the engine compartment. A spray shield was fitted over the turret hatch; this gave the appearance of a tall cupola. All openings and joints in the hull, including the turret ring, were sealed with rubber, to insure waterproof integrity.

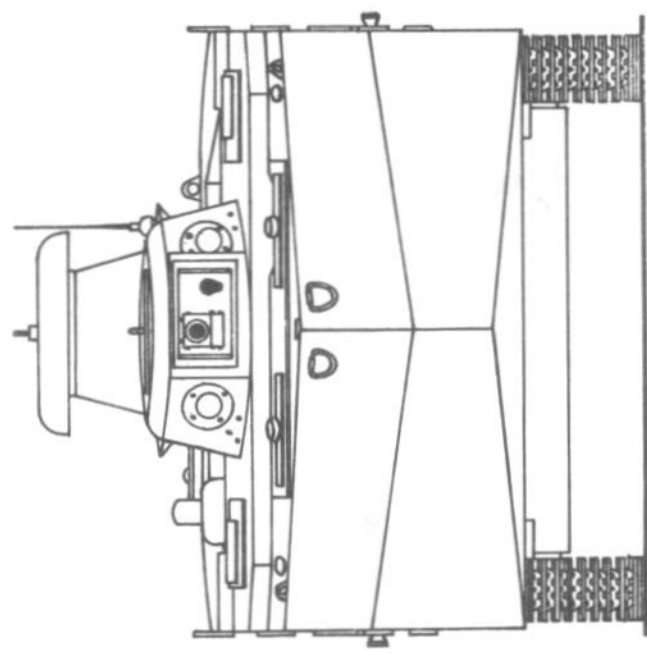
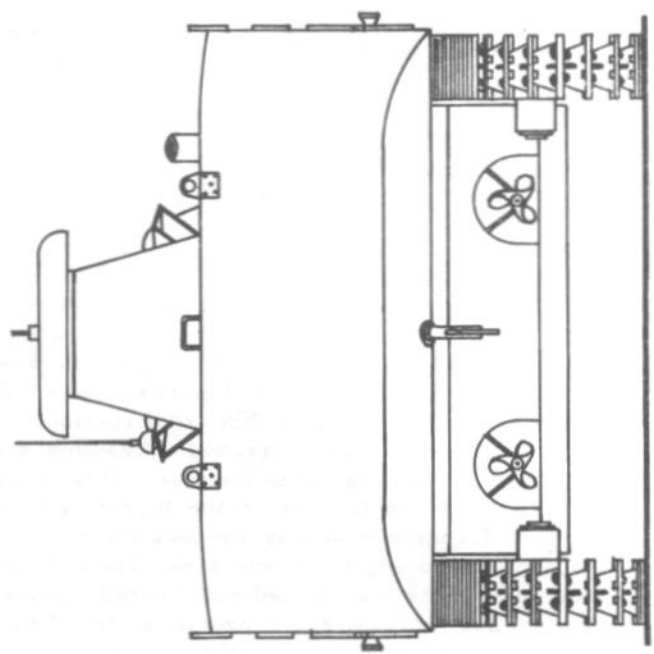
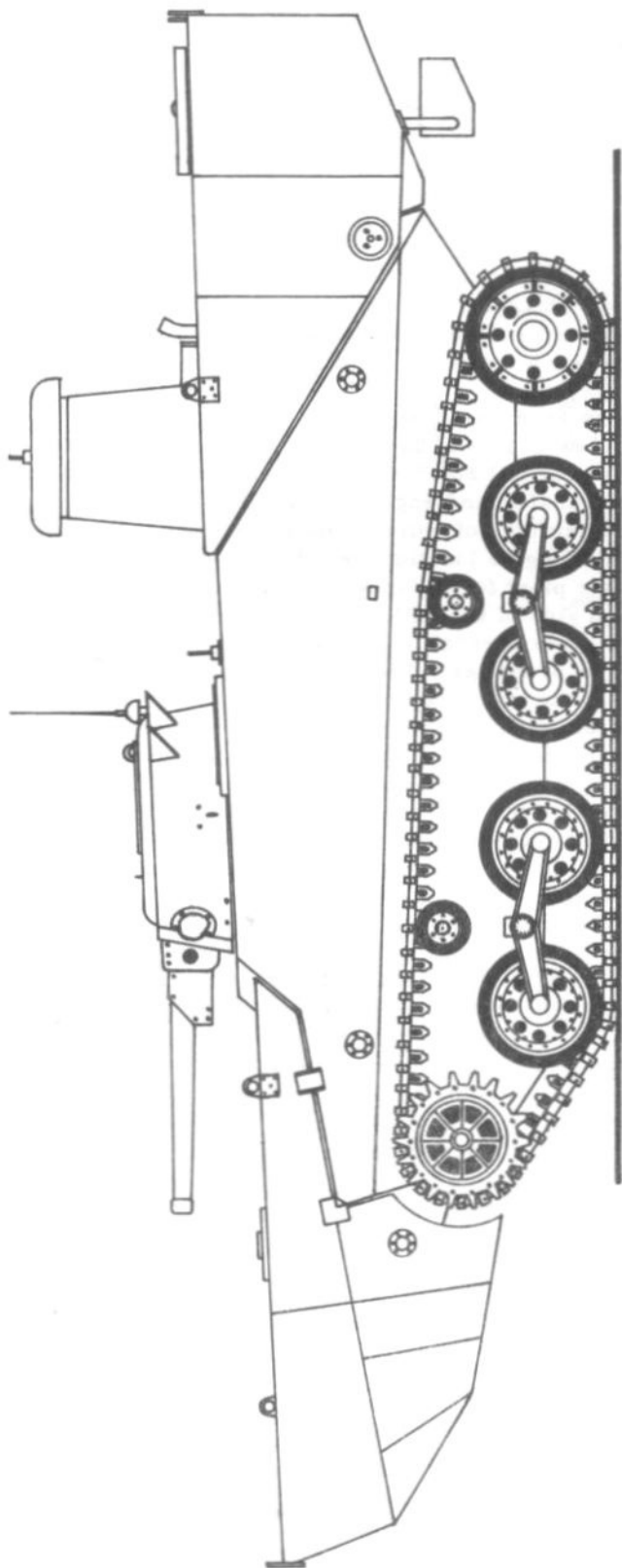
The "Ka-Mi" Type 2 Amphibious Tank was first introduced in 1942, and it probably was a very successful amphibious vehicle, for it was used by both the Japanese Navy and the Imperial Marines, and was the only amphibious vehicle produced in any quantity by the Japanese. Combat useage of the vehicle is not known, although photographs show examples captured by U.S. Marines.

Data Table: Japanese Type 2 Amphibious Tank "Ka-Mi"

Characteristics:	
Weight with Pontoons:	12,458 tons
Weight without Pontoons:	10.5 tn.
Length with Pontoons:	24'-4"
Length without Pontoons:	15'-10"
Width:	9'-2"
Height:	7'-8"
Ground Clearance:	14"
Crew:	5
Armor:	
Turret Top:	6mm @ 90°
Turret Rear:	12mm @ 90°
Turret Sides:	12mm @ 90°
Turret Front:	12mm @ 90°
Superstructure Front:	12mm @ 28°
Hull Nose:	12mm @ 60°
Turret Rear:	12mm @ 36°
Glacis:	6mm @ 83°
Hull Sides:	10mm @ 0°
Superstructure Sides:	10mm @ 0°
Engine Compartment:	8mm @ 17°
Rear Deck:	6mm @ 60°
Belly Plate:	6mm
Tail Plate:	10mm @ 10°
Armament:	
Main:	One 37mm Type 1 Tank Gun
Elevation:	Plus 5-1/2°
	Minus 11-1/2°
Secondary:	Two 7.7mm Type 97 Machine Guns
Elevation:	Plus or Minus 35°

Ammunition:	
Main:	HE & AP Total 132 Rounds
Secondary:	3500 Rounds
Engine: 6 cyl. Air-cooled, Diesel	
HP:	120 @ 1400 r.p.m.
Fuel Capacity:	53 Gal.
Transmission:	Straight Sliding
Gear Type:	4 Speeds Forward, 1 Speed Reverse.
Drive:	
Land:	Front Sprocket
Water:	Twin Propellers
Steering:	
Land:	Clutch & Brake
Water:	Rudder & Propellers
Track:	
Track Centers:	8'-1/4"
Distance from Sprocket to Rear Idler:	12'-8"
Diameter - Rear Idler:	26"
Diameter - Sprocket:	19-1/2"
Diameter - Return Roller:	12"
Track:	Steel Link & Pin Engaging
Track Length:	32'
Ground Contact:	10'-10"
Link Length:	3' 7"
Link Width:	12"

Vision:	
Driver:	Slit (4" x 1")
Hull Gunner:	Slit (4" x 125")
Commander:	2 Slits (4" x 125")
Gunner:	2 Vision ports each side of main gun (3.75" Dia.)
Bow Pontoon:	
Max. Height:	47"
Max. Length:	127"
Max. Width:	110"
Stern Pontoon:	
Max. Height:	44"
Max. Length:	85"
Max. Width:	110"
Obstacles:	
Trench:	6'-7" wide
Step:	2'-5" high
Speed:	
Max. Land:	23 m.p.h.
Max. Water:	6 m.p.h.
Radius of Action:	
Land:	124 miles
Water:	93 miles
Communications:	
Internal:	Interphone
External:	Radio
Escape Hatches:	
Turret:	2 - one each side
Hull:	2 in belly

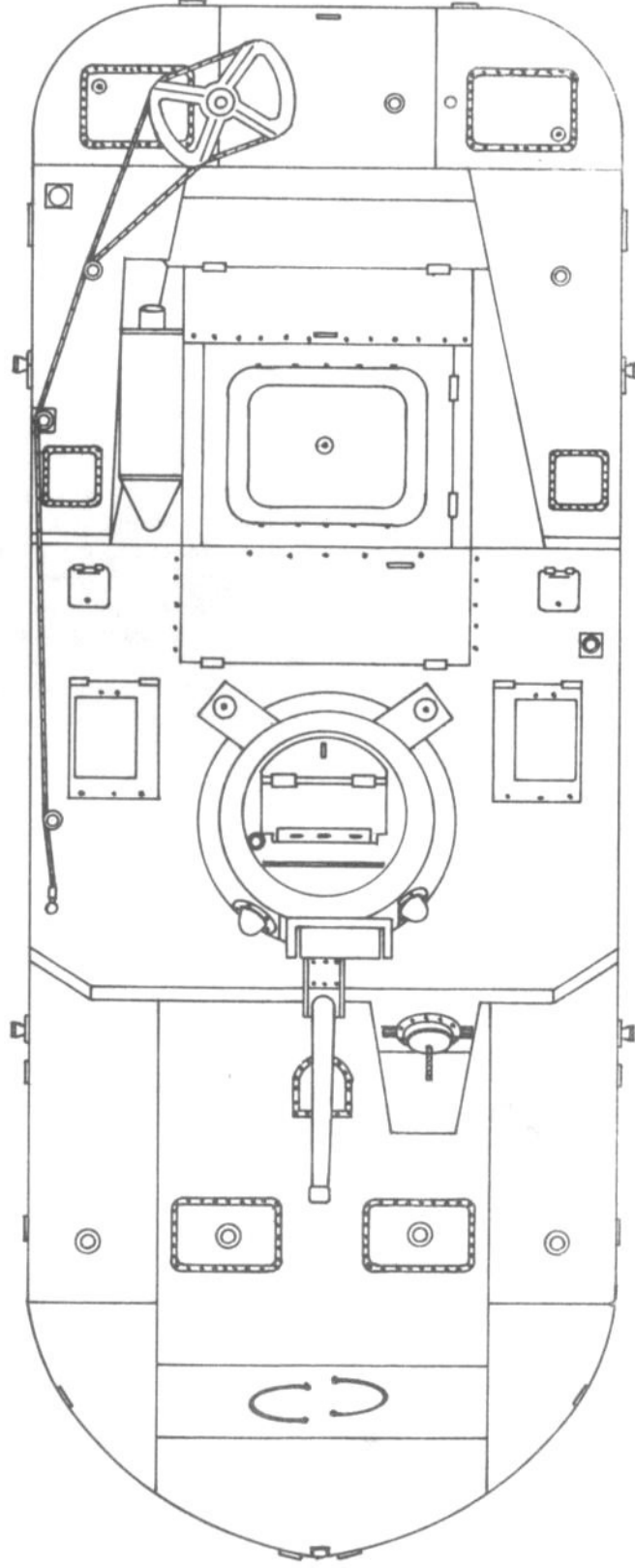
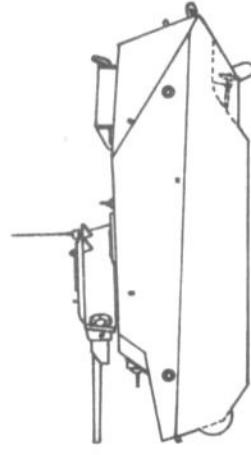
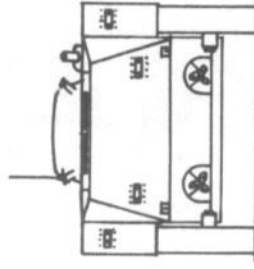
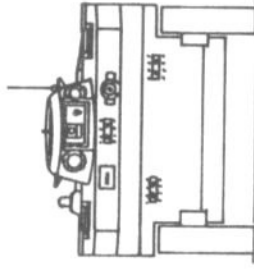
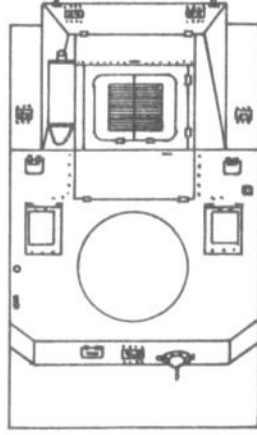


The Japanese Type 2 Amphibious Tank

'Ka-Mi'

1:32 Scale

by S.R. Cobb





Book Review:

The Military Jeep Complete, Edited by Dan R. Post
(Post Motor Books, Arcadia, Calif., 511 pages, \$8.00)

This book is, as the title suggests, a complete mechanical reference work on the World War II. Willy's MB and Ford GPW "Jeep" vehicle. It was prepared with the historian and vehicle enthusiast/restorer in mind, as it is a reprint, in their entirety, of the three main Technical Manuals published during the war by the U.S. government on these popular vehicles. These manuals were as follows:

TM 9-803; this is the basic Operator's Manual, covering operation and basic maintenance of the 1/4-ton "Jeep" vehicle (inspections and trouble-shooting included). The photographs and diagrams include many of special interest to the modeler, showing the small details of the "Jeep" in a clear fashion.

TM 9-1803A; this second part of the book deals with the engine and engine accessories, providing detailed information for rebuilding and maintaining the four-cylinder power plant that was unique to this small combat vehicle.

TM 9-1803B; this last part of the book covers the power train, frame (chassis) and body of both the Ford-built (the GPW) and the Willy's-made (the MB) vehicles. Every conceivable detail is shown and mentioned.

Also provided in this volume is a portion of TM 9-2853, on the deep-water fording equipment; this shows the modifications made to permit amphibious and stream crossings with "Jeeps". (This material is quite rare and unusual.) The editor has also included a comprehensive cross-index to permit easy access to any item of information on the vehicle.

If you are a "Jeep" enthusiast, this book is an absolute "Must" for your bookshelf. If you've ever thought about buying and restoring a "Jeep", this book by Mr. Post is a primary requirement. And, if you're a serious modeler, this is the best source to be found on this vehicle. It's well worth the price of \$8.00 from the publisher; Post Motor Books, 125 South First Avenue, Arcadia, California 91006.

Book Review:

British and Commonwealth AFV's, 1940-46, edited by Duncan Crow
(Profile Publications Ltd., Berkshire, England, 315pp, \$19.95)

At first glance, it would seem that this rather impressive volume is but a reprint of the series of "AFV-Weapons Profiles" dealing with British equipment. However, first glances can be often deceiving. While twelve individual "Profiles" are included, virtually unchanged, the editors have also included over 120 pages of new material. These additions consist primarily of a fifty-page history of the 79th Armoured Division, and two chapters on the Armoured Units and Formations of the British Army and the Commonwealth countries.

Unfortunately, the work inherits several of the problems of the Profiles. Foremost of these is the inconsistency of coverage. Many vehicles are handled quite well; however, others are skimmed-over and some are left out completely. While those omitted are generally covered in Volume II. of this same series (British AFV's, 1919-40), their absence in Volume III. leaves a number of gaps in the coverage of the World War II. period. The fact that there is a section on the Australian use of the Matilda in the Pacific, but nothing on the same vehicle in British service is a bit frustrating. Of course, this problem can easily be remedied by acquiring Volume II.; and, together, the two books provide an excellent background on British armoured vehicles. Although some would consider this book expensive, there is an abundance of material on armour and armoured units that will provide much enjoyment to the serious armoured vehicle fan, and if you're an enthusiast on British armour, this book should be on your bookshelf.

"Photo Epilog" -

German Self-Propelled Flak Weapons

shows the mounting of the twin MG34 machine gun basket mount in the more-or-less standard light car of the late 1930's in the German Army. This mount was known as the "Zwillingssockel 36" and it used special 75-round magazines to provide a limited amount of ammunition to each gun.

The lower photograph shows a captured sample of the 2cm Flak 38 anti-aircraft gun, mounted on the one-ton unarmored Sd.Kfz. 10 halftrack. This particular vehicle was captured and used by the British Army in Normandy where it accounted for several German aircraft. The picture clearly shows the side screens which fold down to permit the full 360 degree traverse of the weapon. The boxes shown on the outside of the wire sides were used to hold extra magazines for the gun. This vehicle was widely used by German motorized infantry units.





How to Avoid a Mini Arms Race.....

by William Platz

Last month the United States and the Soviet Union formally agreed to limit their development and production of weaponry. A very reasonable idea, especially when applied to the massing of miniature armies used in wargaming. Indeed, had my old colleague and worthy opponent, Barnesdall Fosdick, followed this course of action he would still be with us today. (Barnesdall suffered a fatal mishap when, opening his game room closet to put away a newly acquired Company of Sherman tanks a mass of 4,000 lead-weighted HO scale "Minitanks" descended upon him from an overbalanced shelf.) But then, he was always an impetuous lad and would probably broken any agreement made anyway..... Nonetheless for the wargamer who wishes to avoid "Fosdick's Fate", or perhaps is not so financially well endowed; here are a few hints on building a miniature army (or two or three) on a modest budget.

Once bitten by the wargame bug, the first impulse is to dash madly out to purchase a vast array of gaming pieces. This impulse must be restrained! Calm and careful consideration is needed here. First, the extent of the available space must be ascertained. (A process requiring delicate diplomatic negotiations with the female members of the household.) Once this has been determined, you are ready to make your first command decision..... what scale equipment to use. For WWII. buffs, the best choice would be the 1:285th GHQ Microarmour or the 1:150th Greening Scale AFV's. Since these lines provide a wide range of appropriate vehicles in a scale that allows a reasonable battlefield to be constructed on a ping-pong table. For those more interested in contemporary disputes, the "Minitanks" (1:87th scale) series, supplemented by Roskopf 1:100 models, offer the best range of vehicles; and for the modeler who is only an incidental wargamer, 1:76th and 1:32nd/1:35th scales offer a good range of vehicles with plenty of detail, but requiring a rather large playing area.

Once the scale question has been answered, you are ready to begin the "great arms race". Again forethought is required. No matter how impressive the beauties of the Wehrmacht war machines, or how endearing the homely Sherman's silhouette, no wargame army should be composed of a perponderance of one nationality or another. The purchase of your playing pieces should be carefully balanced to insure equal numbers for all sides. Even the true fanatic must realize that his beloved Panzers must have targets and it is often difficult to find an opponent who is willing to be both outnumbered and outclassed. (Rule-of-thumb: For each Axis piece acquired, buy one Allied item of equal combat value. The same applies in modern wargaming, NATO pieces offset Soviet Bloc.)

Quantity is another thorny problem. Wargames are generally more interesting when they call for a wide variety of weapons. Yet there is a limit to the numbers of pieces a player can effectively handle. As a result, a company or two of each type of vehicle should be adequate. By using company level units, you will have enough command and service vehicles for most situations, plus quite a bit of historical accuracy. (A company level organization chart is included in each issue of AFV-G2.)

A final word when buying equipment. Select the period or campaign of greatest interest and build up two tank companies, an anti-tank unit and an artillery battery for each of the belligerents. In the case of the North African desert campaign, this would involve Pz. Kpfw. III. and/or Pz. Kpfw. IV. tanks, "Marder" tank destroyers (or 88mm Flak guns) and 105mm or 150mm Field Guns for the Axis; and "Crusader" and/or "Grant" tanks, 6-pounder anti-tank guns, and 25-pounder Field Guns for the British. All of these items are readily available, or an easy conversion, in both Microarmour and Airfix 1:76th scale miniatures. The cost for such a collection would be under \$80 in either scale. Acquired in small balanced increments, these vehicles will provide interesting games from the first, and when completed with the addition of a third tank company, will represent historically accurate units of the desert war..... A German Kampfgruppe and a British Armoured Regimental Group, for instance.

The same can be done with other theaters of combat, such as the ETO or the Russian Front, but remember..... avoid "Fosdick's Fate"..... Plan Ahead.

The DEFENSE of SICILY



BY The 15. Panzer- Grenadier-Division



Part Four

by James Steuard

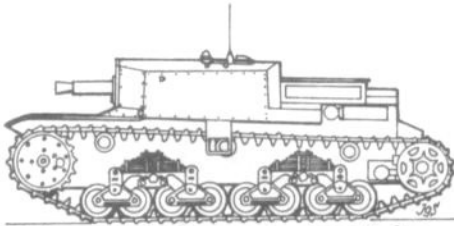
With the "resignation" of Mussolini as "Chief of State", brought about by a clique of high Italian officers united with King Emmanuel III., the end of the struggle for Sicily was in sight. Hitler, after an initial angry outburst which threatened Italy with immediate "occupation", ordered the Oberkommando der Wehrmacht (OKW) to plan the evacuation of all German troops from Sicily. Hitler's initial pique demanded the evacuation immediately (within two days at the most), leaving all heavy equipment behind, but saner reasoning soon prevailed. Orders from the OKW were forwarded to Feldmarschall Kesselring and to General Hube, the commanding general of the XIV. Panzer-Korps (the major German command on Sicily), informing them of the withdrawal intentions. Both officers were directed not to reveal these intentions to the Italians, but General Hube was directed to assume tactical control of all ground units on Sicily (including any Italian units) from the Italian Sixth Army commander, General Guzzoni. When Hube presented this demand to Guzzoni on July 22, the Italian commander refused to turn his command over to the Germans; in this decision, he was supported by the Italian High Command. However, by July 25th, Guzzoni clearly recognized his dependence upon German units, and also the German shift to the defense (abandoning Guzzoni's plan for counterattacking). Therefore, he compromised with General Hube, allowing him to conduct the actual defense, while Guzzoni remained in over-all command.

Now that the Germans held the reins, the character of the defense changed. Elements of the 29. Panzer-Grenadier-Division had been moved along the north coast, to make contact against the American units moving eastward. With the exception of a few scattered elements of the Italian "Assietta" Division, the entire defensive front was held by German units; the 15. Panzer-Grenadier-Division was continuing to hold the center of the line against the U.S. 1st and 45th Infantry Divisions. The supply situation had improved with the lessening of the distance that they had to be moved, and for the first time German artillery units were able to "stockpile" supplies of ammunition for unrestricted use. German units had also started the process of acquiring abandoned Italian equipment, such as armored cars, artillery pieces and truck transport; these items were used to augment the strained and inadequate amount of German equipment that was still serviceable.

The terrain now favored the defender more than at any previous time in the defense of the island. The Caronie Mountains which form the backbone of the northeastern part of Sicily are rugged and steep. Succeeding rows of hills running parallel to the German defense lines offered unlimited visibility over the approach routes and the Germans were quick to take advantage of the fine

fields of fire. German engineer units spent all of the available time, laying mines and preparing fortified defense positions atop the steep hills, in depth. The narrow stream beds between the hills were sown with anti-personnel mines, and German mortar crews expertly measured and calibrated their weapons' sitings so as to provide maximum accurate fire support for the defending infantry.

Following the German "take-over" of the defense, the first action in the 15. Pz. Gren. Div. sector took place in front of Nicosia. Elements of the U.S. 26th Infantry Regiment moved to seize the high ground west of the town (three hills numbered 825, 937 and 962). These positions were occupied during the night of 24-25 July. At first light, however, German artillery began to batter the American positions along the front (and it was apparent that German forward observers were looking down the American's throats), and then a battalion-sized counterattack (probably from the I./Pz. Gren. Rgt. 129) was launched by Oberst (Colonel) Fullriede to retake Hill 937. Fierce fighting took



*Italian 75/18 Semovente Assault Gun
used in support of 15. Pz. Gren. Div.*

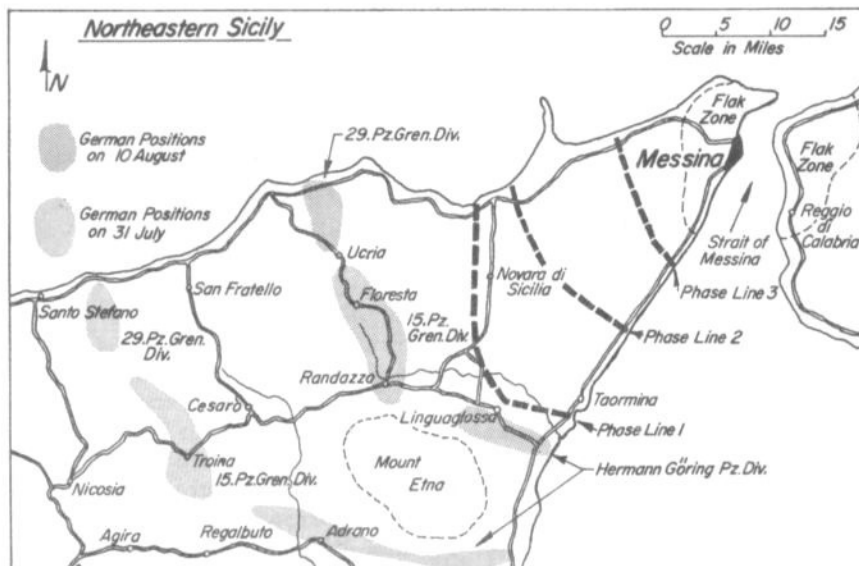
place throughout the morning and early afternoon, and by evening, the U.S. units had outflanked the Germans on the hill, forcing them to withdraw. The American commander following-up closely behind the German withdrawal, ordered his I. Battalion to take the two hills 800 yards further east. German artillery and mortar fire brought this attack to a stop before it really got started. The Germans again counterattacked (!) and the U.S. 26th Infantry spent the afternoon of 26 July defending against these attacks. On the 27th, the U.S. 16th Regimental Combat Team (RCT) was released from Corps reserve and it tried to outflank the Germans from the south, with no luck

whatsoever. In the afternoon of the 27th, an American battalion-sized force of tanks (from the 70th Light Tank Battalion and the 753rd Medium Tank Battalion) made an offensive "sweep" into the German lines, to attempt to "jar" the enemy loose. This attack cost the U.S. units three light tanks, but apparently succeeded in its plan, as the Germans began to withdraw behind Nicosia. In actuality General Hube had ordered General Rodt to start his withdrawal back to the "Etna" Line, in preparation for the "secret" evacuation of the island.

A highly indignant protest from General Guzzoni to the German commanders brought promises to stop this withdrawal, but apparently orders arrived too late at the German unit's headquarters to effect the move. Small Italian units also retreated, without orders, when they saw the German units moving back, and consequently, the orderly withdrawal almost became an open invitation for the Americans to attack, outflanking the elements of the 29. Pz. Gren. Div. on the north. During the 28th, as the U.S. forces took Nicosia (with little real opposition), the other battlegroup of the 15. Pz. Gren. Division, Kampfgruppe Ens, pulled-back from Agira and moved to link-up with Kampfgruppe Fullriede. On the next day, the elements of the 29. Pz. Gren. Division pulled-back in line with the units of the 15. Pz. Gren. Div. (at this time, Kampfgruppe Ulich of the 29. Pz. Gren. Div. was under orders from General Rodt). As the German withdrawal time-table went into effect, the Ameri-

cans prepared to renew combat with a fresh division, the 3rd Infantry, in the north, while the 1st Infantry Division continued its efforts against the 15. Pz. Gren. Division in the center of the line. The scene was now set for the "bloodiest battle of the Sicilian Campaign", the attack on Troina.

Troina, a town of some 12,000 inhabitants, was situated on the northern slopes of Mount Etna, and it was the hinge and pivot of the German "Etna" Line. The town itself, as well as the steep hills on the north, was defended by Kampfgruppe Fullriede, Pz. Gren. Rgt. 129. The heights to the south of the town were the responsibility of Kampfgruppe Ens, or Pz. Gren. Rgt.



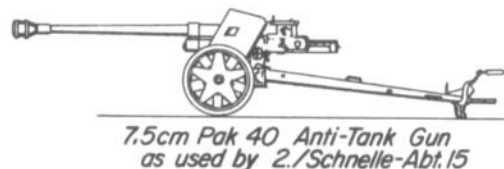
104. The Americans, utilizing somewhat limited observation, believed Troina would be defended lightly, if at all. The Germans, under effective camouflage, skillfully prepared extensive positions, complete with the remaining tanks of Panzer-Abteilung 215, to act as mobile artillery. In addition to the four organic artillery battalions of the division, General Rodt had also absorbed the artillery units from the Italian "Aosta" Division, making a most powerful force of guns.

On the American side, the U.S. 1st Infantry Division deployed its 16th RCT, 18th RCT and 26th RCT with probing patrols eastward from Nicosia. The 39th Infantry Regiment (from the 9th Infantry Division) was attached and scheduled to start the attack on Troina on 31 July. To support the attack, if needed, the 1st Infantry Division Artillery had four organic battalions, four attached battalions from the 9th Infantry Div., and seven battalions attached from II. Corps (making a total of 165 pieces of artillery).

The initial attack of the 39th Infantry, personally led by its eccentric commander Colonel H.A. "Paddy" Flint, jumped-off at dawn and took Cerami (in front of Troina) with little opposition. The continuing attack began to receive heavy artillery and mortar fire and was soon pinned-down. On the next day, an attack by the III. Bn, 39th Infantry was stopped cold, forcing the units to deploy along the line of departure. A small German counterattack was stopped but German artillery fire continued all day, pinning the attacking units down and causing heavy casualties. On August 1st the 26th RCT moved to keep the attack going, they too met heavy artillery and were stopped. By the next day, all U.S. units of the division were trying to find a way into Troina. U.S. artillery battered the town and all suspected enemy positions, with no visible effect as the German artillery, mortar, tank and machine gun fire continued to frustrate all attacks on Troina. On several occasions, German units supported by tanks made counterattacks which were only stopped by massed artillery. In spite of the heavy pressure which included A-36 dive bomber attacks, the German positions remained firm. The Americans were taking heavy casualties from the highly accurate German fire, which was like nothing the Allies had seen before. However, the German forces were also being hurt, even if this was not evident to the American observers. General Rodt had lost over 1500 men to American artillery and bombing and he was asking General Hube for more reinforcements, if he was to successfully continue to hold the Troina position. After General Hube gave his last reserve troops to the 15. Pz. Gren. Division, he began to seriously think about pulling-back to the next defensive line. In the north, the 29. Pz. Gren. Division had also been having problems, as elements of the U.S. 3rd Infantry Division executed amphibious landings which were successfully turning the German flanks. On 5 August, General Hube (over General Guzzoni's protests) authorized the start of the withdrawal, and by dawn on 6 August, it was clear to the Americans that Troina was clear of the enemy. The 1st Infantry Division, though, was in no condition to follow-up on the retreating Germans, being sadly depleted in strength after six days of hard combat.



While all of the fighting had been taking place, the OKW had completed planning for the evacuation. Oberst Baade was appointed commander of the Straits of Messina area, and Fregattenkapitän von Liebenstein, the Navy transport commander, was ordered to prepare shipping for the evacuation. On 2 August, Feldmarschall Kesselring endorsed the evacuation plans and notified Hitler through the OKW of the intentions. By 9 August, the evacuation plan was ready for execution, and General Hube notified his three division commanders of the detailed time table for their unit's moves.



Oberst Baade had prepared a "Flak-Zone" in the area of Messina, with over 500 anti-aircraft guns of medium and heavy caliber on both sides of the strait. This potent force had the job of keeping the Allies away from the straits, while the evacuation was in progress. The actual moves were to be done at night, to provide additional security. Fregattenkapitän von Liebenstein had acquired a fleet of boats and flat-bottomed Siebel ferries, sufficient to move all heavy equipment, and all was in readiness to move some 8000 men and equipment each night.

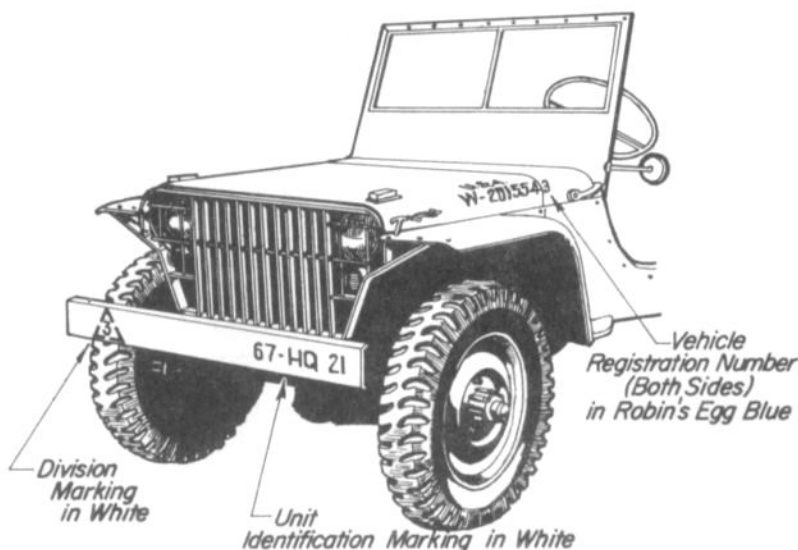
The first German unit designated to be evacuated was our 15. Pz. Gren. Division, due to its reduced strength and combat effectiveness after the Troina fighting. The other German units extended their flanks to cover the center sector, and on the afternoon and evening of 10 August, General Rodt's command moved eastwards along the good roads towards Messina. German observers noted the tired and weary unit's still-excellent march discipline and good morale. The division was leaving Sicily with more transport than it had when it came; as numerous Italian abandoned trucks had

Continued on Page 30

COLOR 'N CAMOUFLAGE

The Ford GP Quarter-Ton "Jeep"
in Early Service - 1942

by James Steuard



of both Bantam BRC and Ford GP models, and these vehicles were apportioned-out to the various Regiments and Battalions of the division, on a basis of two or three "Jeeps" per unit, for testing.

The light Bantams and Fords arrived from the factory sporting a coat of dull Olive Drab paint that had rapidly become the standard finish for military vehicles. The exact shade of this paint seemed to vary from manufacturer to manufacturer, and from vehicle to vehicle, so no attempt will be made here to represent the exact color (in paint-chip form).

All vehicles of the U.S. Army (at this time) were identified by Registration Numbers, painted in three locations on the vehicle (usually). Generally, these numbers were applied, on wheeled

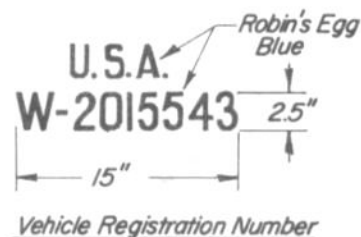
vehicles, to both sides of the engine hood (so as to be visible to the sides) and to the rear "tail gate" (so as to be seen to the rear). The Registration Number, on our Ford GP vehicle, was applied only to the hood sides. This number was not applied by the using unit, except in cases requiring re-painting; instead it had either been painted by the manufacturer or at some Ordnance Depot prior to delivery, as photos show newly arrived vehicles devoid of other markings but complete with Registration Number. This number was painted on the vehicle in a shade of Robin's Egg Blue paint (duplicated at left), which was designed to limit the distance at which the numbers could be read (to under 75 yards) and also prevent identification of vehicles in air photographs (as the film was blind to a light blue paint).

On our Ford GP vehicle, the Registration Number was painted in characters 2-1/2-inches high, in two rows, as shown to the right. The "U.S.A." was painted on the flat upper part of the hood, while the "W-2015543" was applied on the curved outer edge of the hood, as shown above. The initial two digits "20" identified the vehicle as being a reconnaissance car, and the following numbers identified the vehicle specifically. Each of the three manufacturers of the prototype "Jeeps" had been assigned blocks of Registration Numbers to be used, and our Ford GP appears to be one of the last vehicles of the production run by the Ford Motor Company.

Although reference material is rather hazy on this point, it

By the fall of 1941, the first examples of the small, light vehicle that was to become the best known vehicle of the U.S. Army began to arrive in units for field testing. These initial vehicles had been manufactured by three diverse companies, under different conditions, and units of the field army were now to test them to determine the one best suited to the Army's requirements. Would the Army select the Bantam, the Ford or the Willys?

At Camp Polk, Louisiana, the 3rd Armored Division had been established in training since the summer of 1941, and it was natural that some of the new recon-trucks be provided to this division. They received some forty test samples



seems probable that all markings to be applied to military vehicles were to be painted in the light shade of blue described above. Why this was not done is not known. It was perhaps due to a shortage of the proper blue paint, or to a lack of directions from higher headquarters. Whatever the cause, all other markings on vehicles of the 3rd Armored Division at this time were applied in white paint. Indeed, some photos even show the Registration Numbers painted in white (specifically against orders)! (As a point of interest, the idea of the light blue paint was officially dropped by the U.S. Army some time in 1943.)

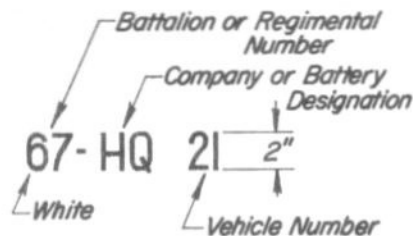
In early 1942, when our Ford GP was pictured in service, standardized markings had not been established in the Armed Forces. The Division and Unit Identification Markings that were applied to vehicles of the 3rd Armored Division certainly reflect this fact, as they followed a divisional system peculiar (as far as the author can tell) to this division. The Division was identified by a white triangle (to indicate the "armored" status of the division) in outline form, with the number of the division, also in white, in the center of the triangle, as shown at the right. The triangle was evidently applied by using a stencil, and the number "3" was hand painted after the triangle dried. While the size of this marking varied, it was applied full-height of the bumpers on our Ford GP "Jeep", on the left side of the bumper when viewed from the front. On the rear, this same marking was applied to the right side of the vehicle on the small individual bumper, again painted the full-height of the bumper.



Division Marking - 3rd Armored Division - 1941-42

The using Unit of the Division was identified by a code system that was similar to that later to be established as "standard" in the Army. This Identification Marking consisted of three groups of numbers and letters, painted in a row on the right side of the front bumper in white paint. The first two digits, "67" in our case, identified the Regiment or Battalion that "owned" the vehicle.

Since all units of the 3rd Armored Division had different numbers, the group of two or three numbers was sufficient to fully identify the user. The "67" identified the "owner" of our Ford "Jeep" as the 67th Armored Field Artillery Battalion, which had been provided with two sample "Jeep" vehicles (the other one was a Bantam BRC). Other user "codes" in the 3rd Armored Division were: "32" - 32nd Armored Regiment, "33" - 33rd Armored Regiment, "36" - 36th Armored Infantry Regiment, "54" - 54th Armored Field Artillery Battalion, "391" - 391st Armored Field Artillery Battalion, "45" - 45th Medical Battalion, "83" - 83rd Reconnaissance Battalion, and "3" - the 3rd Divisional HQ units. (Each of these units received some "Jeeps").



Unit Identification Markings

The second group of identification markings indicated the sub-unit within the regiment or battalion; in our case, the letters "HQ" indicated that the vehicle was in use with the Battalion's Headquarters Battery. The letters "A", "B", "C" and so on indicated Companies or Batteries in the battalions; the letter "S" indicated a "Service" Company, while the divisional Administration Company used the letters "AD". On the far right of the three groups appeared the individual vehicle number; in the 67th Artillery, the second vehicle carried the number "2" so whatever system was used to number vehicles at this time is not clear.

On the rear of the vehicle, the same code numbers were applied to the left bumper in two rows, with the "67-HQ" on the top, and the number "21" appearing below this.

It is interesting to note that the prominent white stars, so common on later vehicles, were not used on any vehicle at this time. The only national markings evident appeared on the division's armored vehicles and this took the form of the early white star with a blue circle background and a smaller red "dot" in the center of the star. Our Ford GP was totally devoid of national markings.

The outcome of the field tests of the three makes of "Jeeps" was clear from the start. The U.S. Army needed this type of vehicle to equip command and reconnaissance units. The outcome of the tests showed that the Willys's product was superior to the Bantam and the Ford, and the production contracts were awarded to Willys, who then proceeded to modify their vehicle (borrowing freely from the other two types) to conform to newer requirements. The final product, built by both Willys (as the Model MB) and Ford (as the Model GPW) was the "Jeep" so familiar to veterans, and military vehicle enthusiasts. Supplied in quantity to our Allies as well as to our own units, the idea of the "Jeep" spread and influenced vehicle-design to the point where most current armies have a vehicle, copied if not similar to the World War II. "Jeep", as a standard vehicle.

The German Armored Halftrack Anti-Tank Company of 1945

by James Steuard

In early 1945, when the 1945-style Panzer-Division was designed and authorized, the planning staff of the Inspekteur der Panzertruppen who had the responsibility for armored units decided to eliminate the towed anti-tank gun from the new armored divisions. In 1944, the acceptance of limited mobility towed anti-tank gun units in armored divisions was forced on the Germans as a matter of necessity, due to the unavailability of large numbers of self-propelled guns. By 1945, there still was an inadequate supply of self-propelled weapons, but the limitations of the towed 7.5cm Pak 40 anti-tank gun made it mandatory to find a substitute self-propelled weapons system.

The substitute was found through the creation of an anti-tank gun mount on the old armored infantry workhorse, the armored halftrack (or Sd.Kfz.251) personnel carrier. This anti-tank version of the medium halftrack was the last variant to be constructed on this chassis, and was designated Sd.Kfz.251/22. The vehicle used was the basic infantry version, with a standard 7.5cm Pak 40 anti-tank gun mounted in the former crew compartment, minus the wheels and trails. The barrel pointed forward with limited traverse, and this heavy gun overloaded the chassis of the vehicle severely. However, with a relatively simple modification (which could be done in field workshops, if required), a suitable mobile anti-tank gun weapons system could be created, which, it was hoped, would improve the performance of armored anti-tank gun units in combat.

The 1945-style Panzerjäger-Abteilung (Anti-tank Battalion) of the Panzer-Division consisted of the following units:

Stab und Stabskompanie

1. Panzerjäger-Kompanie (Sfl.)

2. Panzerjäger-Kompanie (Sfl.)

3. Panzerjäger-Kompanie (SPW)

Versorgungs-Kompanie

Headquarters and Headquarters Company

1st Self-propelled Anti-Tank Company

2nd Self-propelled Anti-Tank Company

3rd Armored Halftrack Anti-Tank Company

Supply Company

The 1st and 2nd companies were each equipped with ten of the excellent Jagdpanzer IV tank destroyers, or the Jagdpanzer 38(t) "Hetzer", which was an alternate for the vehicle based on the Panzer IV tank chassis.

The 3. Kompanie, as indicated by the title, was organized and equipped with the Sd.Kfz.251/22 armored halftrack, mounting the powerful 7.5cm Pak 40 anti-tank gun. It was organized under a Kriegsstärknachweisung (or Wartime Table of Organization) numbered 1148, dated 3 April 1945. It is not known if this organization was the earliest type of unit to utilize the Sd.Kfz.251/22 vehicle; KStN 1148 may have had an earlier edition. The company had 3 officers, 16 non-commissioned officers and 45 enlisted men, equipped with a total of 17 rifles, 21 pistols, 24 sub-machine guns and 1 light machine gun (which was in the headquarters Sd.Kfz.251/3 communications vehicle), in addition to the 9 vehicular-mounted 7.5cm Pak 40 anti-tank guns.

The company was organized with a Headquarters Section (Kompanie-Trupp) provided with two light cars (typically the Volkswagen Type 82 Kübelwagen), a tracked-motorcycle (Kettenkrad Sd.Kfz.2) for messenger duties between the company and its parent battalion, and an armored signal halftrack for communications purposes. With a total of 1 officer, 6 NCO's and 5 enlisted men, this headquarters section shows the gradual size decrease in these units during the war's course.

The company had three combat platoons as the fighting components of the unit. While the 1st and 2nd Platoons were led by 2nd Lieutenants (or Leutnant in German), the 3rd Platoon was led by a senior non-commissioned officer. Each platoon had three Sd.Kfz.251/22 vehicles, a light car and a 350cc motorcycle as a communications vehicle. The Platoon Leader used the light car for personal transportation when not in combat; when combat was eminent, he shifted into the #1 anti-tank vehicle to lead the unit in the fighting. The light car and motorcycle were then used for messenger purposes.

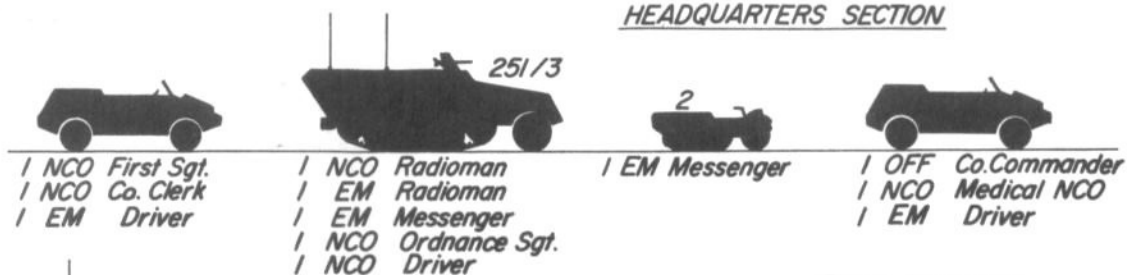
As a combat "trains", the Panzerjäger-Kompanie (SPW) was provided with a much-abbreviated Ammunition Section, with two 3-ton open-topped medium trucks, each with a crew of two enlisted men. This small section was responsible for ammunition resupply during combat conditions. All other administrative, maintenance and supply requirements of the company were handled by the battalion Versorgungs-Kompanie, under the "freie Gliederung" concept created by Generaloberst Guderian, the Inspekteur der Panzertruppen.

With the very late date of this table of organization, it is doubtful if more than two or three Panzerjäger-Kompanien (SPW) were formed and trained before the war ended. No details are available of any combat useage, and the very few photographs of the Sd.Kfz.251/22 vehicle show a captured vehicle that was apparently found in an equipment park by the Allies.

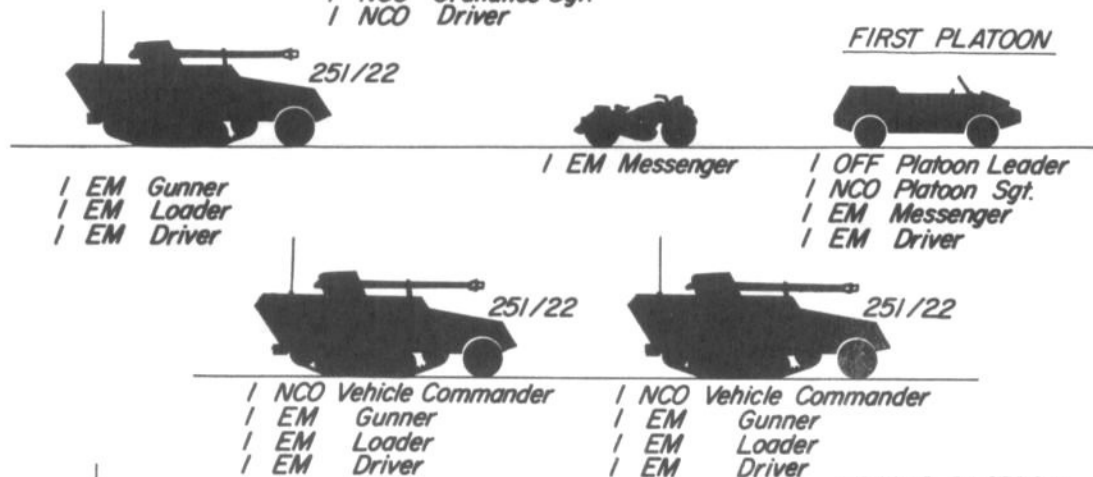
PANZERJÄGER-KOMPANIE (SPW)

KStN 1148 (f.G.) of 1 April 1945

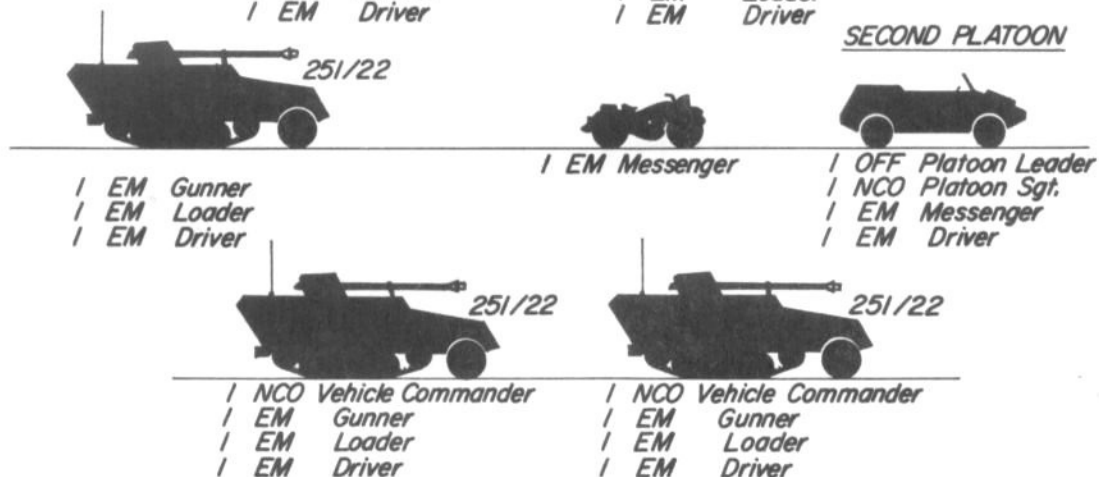
HEADQUARTERS SECTION



FIRST PLATOON

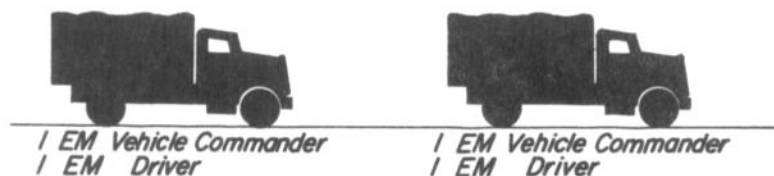


SECOND PLATOON



THIRD PLATOON - Identical to First and Second Platoon except NCO as Platoon Leader.

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The Historian's Notebook

An Effective System of Note Retrieval

by David Royster

As an Associate Instructor in History at Indiana University, I would like to offer a systematic research and retrieval system which many historians use, and which is extremely simple.

Three-inch by five-inch cards are great for bibliography notes, but are often too small to adequately cover the amount of information one may want to use from one book. Therefore it is essential to use cards that can cover material fully, and yet be easily scanned to use in whatever order you may have to rearrange information in. It is therefore advisable that a standard 5" by 8" card be used.

The key to a good notecard is not the Source but the Date, Place and a brief summary of information. To do this, I might suggest the following system.

Each notecard must contain only specific information or a single thought, and since notecards are retrieved by information, rather than source, relegate the source to a brief word in one corner. (It need only be long enough to refer you back to the complete bibliography card with all the necessary information about the book on it -- a 3" by 5" card possibly.) (See AFV-G2, Vol. 3, No. 6 for an example of this. . . . Ed.)

Equally important is the fact to bracket all information in direct quotes. Do not paraphrase, because later when using information one may inadvertently use a paraphrase that is substantially the original source. This is plagiarism and can cause real problems, so get in the habit of avoiding later troubles by doing it right the first time. It may seem like a chore, but it is the only safe way to handle copyrighted material -- use quotes and quotations.

To make recovery of ideas or information easy there is a set form widely used that is extremely simple and I suggest that given below, as an example.

← SAMPLE CARD NO. 1

CUBA
1963-72

Cubans use JS-II. near Guantanamo since 1963, and their "obsolete" armor is no idle threat.

"CUBA: Soviet manufactured JS-II. Heavy Tanks have been supplied in some quantity to Cuba, where they have been in service since 1963. It appears that many of these JS-II. 's are stationed outside Guantanamo Bay, where the U.S. M. C. maintains an armored force. The JS-II., although obsolete by most standards, mounts an extremely powerful 122mm gun and has good armor."

15

J. C. Johns

"Armor G-2", AFV-G2, III., #5

In the first place you should put in the upper right hand corner the following information: Date of event being recorded below, "dated as closely as possible". Below or above it, whichever you prefer, the location of the data, ie. if you are writing about Soviet armor in Cuba in 1972, the location is Cuba because that is what you are talking about, not the USSR (see above). Next as a caption comes a brief word about the gist of what will be quoted below on the card; it should adequately describe information and should be on the top lines of the card with a suggested margin of one-inch on the left and a half-inch on the right (see example).

Then, in quotation marks, put the information in and end the card by putting the following brief information in the lower left hand corner: Author, Title and Page. This will substantially eliminate any goose chases after pages or through magazines for information. Remember, some archives or rare books may only be available once, and so your notecard becomes your only source. Here is another example.

ITALY
March - May 22, 1943

Recognizing Allies would probably invade Southern Europe, anxious Germans send 3 divisions to Italy, despite split with Italian anti-German commander Ambrosio, and they agree to deployment in Italy.

"By March or April of 1943, it had become apparent to both...Italians and Germans that the war in North Africa was coming to a close. Both...were...apprehensive as to where the next Allied assault was to take place...the German...(OKW) was...concerned with the Italian Army's suspected inability...intervention was the only...way to defend the 'soft underbelly'....Opposing this concept...was General Ambrosio, the anti-German Chief of the Commando Supremo. Ambrosio was seeking a...withdrawing Italian units from German control, and...attempting to keep German...divisions out of Italy...."

"On May 6th...Feldmarschall Kesselring offered Mussolini the services of three German divisions: one armored... (the 16. Panzer-Division) to be moved to Italy...one... (Hermann Goring Panzer-Division) to be reconstituted in Italy from units...not...shipped to Tunisia, and a third...created from miscellaneous units...not...transported to...Africa... Ambrosio...accepted...on 10 May. An additional division was soon created on Sardinia... By May 22nd, the Germans and the Italians were essentially in agreement as to the employment of these four divisions."

22 & 23

J. Steuard

"The Defense of Sicily", AFV-G2, III., #5

thin diameter wire, bent with needle-nose pliers and cemented in small diameter drilled-holes. To finally complete each Bridge Section, I cemented thin (approximately 1/16" wide) strips of styrene across the tops of the sections to simulate the planking on the real thing.

The Bridge Sections were fastened to the Supports with large round caps, fitting over round pins that extended vertically from the Supports through the Sections. These could be modeled easily with large diameter pins - Continued on Page 30 -

Behind the Armor versus Shot Contraversy (Continued from Page 9)

The previous armor materials are a homogeneous type - they are the same quality throughout. But still not being satisfied with hardness properties, researchers turned to another well known process, Carburizing. Basically, carburizing is surface alloying of an already formed piece of steel with carbon. This process greatly increases hardness on the surface while keeping good impact strength throughout its bulk. Carburizing gives a Figure of Merit increase of about 65%.

Simultaneously, another new homogeneous steel alloy was developed. By further purifying steels, the alloy amount was lowered. Upon heat treating, the desired armor properties were again improved; this time, with Figure of Merit increases over plain alloy steel of almost 80%. Shortly thereafter, the process of Nitriding was applied to surface harden armor plates. The nitriding process is surface alloying, as in carburizing, but in place of carbon, nitrogen is added. An extremely hard armor face is formed. With high quality steel alloy, the impact strength of the inside, the "core", is kept high. Nitrided armor has over a 90% increase in Figure of Merit. Table IV. shows these armor advances.

METAL	HARD- NESS	IMPACT STRENGTH	PRODUCT	FIGURE of MERIT
Heat Treated Carbon Steel	192	80	15360	1.22
Carburized Steel	363	57	20691	1.65
Heat-Hardened Low Alloy Steel	293	77	22561	1.79
Nitrided Steel	300	80	24000	1.91

TABLE IV.

The advantages of a high Figure of Merit are obvious to tank designers. In effect, if 150mm of alloy steel is needed to stop a type of AP Shot, only about 80mm of nitrided steel would be required for the same penetration resistance. The savings in weight means increased performance - greater speeds and fuel capacity. More and larger caliber armament could be mounted with more ammunition carried and more accurate and extensive gun laying equipment included.

Faced with the dilemma of increasing armor quality, and having reached limitations in the simple increase of AP Shot size, manufacturers of armor piercing projectiles set their scientists to work. Their discoveries and advances are even more extensive than those of armor researchers. These new ideas, both in armor penetrating materials and applications of explosive properties, for example, brisance, will be covered in a subsequent article.

RESOURCES

The material in this article is condensed from chapters in two forthcoming books by the author, Wargamer's Resourcebook and Winning Wargames. Sources used are:

- F. M. von Senger und Etterlin, Die Kampfpanzer von 1916 - 1966, Munich, Germany
- K. Macksey and J. Batchelor, Tank, New York, NY
- J. Wulff et al., The Structure and Properties of Materials, New York, NY
- L. H. Van Vlack, Elements of Materials Science, Reading, MA
- "Materials Engineering", Materials Selector, Mid-October 1968 issue
- International Nickel Company, "Properties of Some Metals and Alloys"

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Product Review: The Tamiya 1:35th Scale Willy's MB Jeep by J. Steuard

The latest release from Tamiya is a 1:35th scale rendition of the Willy's MB (or Ford GPW) 1/4-ton. 4x4 Truck, known as the "Jeep". This was one of the most common US military vehicles used during World War II., and a model has been needed to compliment Tamiya's earlier Volkswagen model. The kit has a most impressive number of parts and comes complete with a trailer and a four-figure crew. The molding is up to Tamiya's high standards, with very little "flash" and an excellent fit of parts. All parts are highly detailed, and with the help of a good reference work on Jeep parts, a truly "museum-quality" model can be easily constructed. The model even has a detailed dummy engine, and for those of us who used to make model cars, this is an excellent opportunity to add superdetailing (such as ignition wiring and engine accessories). If you're going to display the completed engine, I would suggest replacing the hood (or bonnet) with a Vac-u-formed replacement to obtain the scale thickness of metal.

The four figures are also to Tamiya's high standards; three of the figures are in a sitting position, and include the driver, passenger (typically shown in the box art as a Captain) and a rear-seat machine gunner (for the pedestal-mounted machine gun). The fourth figure represents a standing "MP" giving directions. I could find little fault with the figures and their accessories, which include two M-1 rifles, a Thompson M-1 sub-machine gun, bayonets, canteens and grenades. All of the figures feature separate arms, allowing for easy conversions to other positions.

My biggest criticism is in the area of kit decals, and the inadequate and incorrect instruction sheet that makes it so difficult to correctly apply the really nice decals. Only two sets of "USA" registration numbers are provided (and only one has the correct "S" letter suffix) and it would have been nice to have a wider selection of these essential numbers. Incidentally, only one of the four instruction illustrations demonstrates the placement of these numbers. In addition, Military Police markings are shown on a Tank Battalion Jeep, Medic (cross) markings are shown on a "MP" vehicle, and other equally strange misplacements really confuse the modeler who wants to get it right. I really wish that Tamiya could (and would) consult some US military vehicle enthusiasts before they mess the decals up as they did in the Jeep kit.

All-in-all, though, the kit is a really beautiful addition to the excellent Tamiya line, and one that is most needed. It's well worth the very modest price, and is essential for those US and British dioramas.....

Modeling the Hanomag Sd. Kfz. 251/7 (Continued from Page 29).

fastened to the upper plate of the Supports. Holes could be drilled through the Bridge Sections, the proper distance apart, and the Bridges could be fastened to the Supports as was done on the real vehicle.

However you finish the model, you can rest assured that you will own an unusual version of the Hanomag armored halftrack; the Sd. Kfz. 251/7.....

Battered Hulks and Cockleshells.....(Continued from Page 6.)

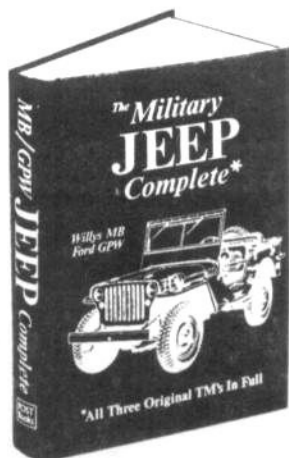
enemy's defensive line. Lt. P. C. Lawry commanded the tank on the left which closed on the German position spitting a stream of bullets from its machine gun. The Germans responded with a hail of mortar and small arms fire. As the tank neared the town, a lucky shot dropped on the rear deck, starting a fire. "Bail Out!" Lawry and one of his crew got clear and managed to crawl back to safety, both of them wounded. On the right, Lt. J. G. Bedells directed his tank toward the German line. About 50 yards from the houses, Bedells hit a mine which parted a track. Still he pressed on until bogged in a patch of soft sand. The German mortars zeroed-in on the stranded tank which continued to blaze-away with both 2-pounder and machine gun. A direct hit from a mortar bomb blew open the turret hatch. A second hit severed the fingers from Bedells' right hand as he tried to close the hatch. A third smashed both guns. Bedells and his crew remained in the tank until after dark and then crawled back to the Australian lines. With the tanks out of action, the infantry were unable to get forward during daylight. A night attack also failed and Campbell decided that without tanks and short of ammunition he must content himself with holding the airfield. This he did until the 29th, when a motorcycle battalion from the 5. Gebirgs-Division broke through from the west - along with two Pz. Kpfw. II, tanks from II. Abteilung, Panzer-Regiment 31. On May 30th, the Retimo garrison surrendered after all hope of evacuation was gone. They had done magnificently but failures further to the west had undone all that they had accomplished. No German aircraft was able to land at Retimo, thanks to Campbell's aggressive spirit, but at Malame, it was to be a different story..... a story to be told in the next issue.

This MB/GPW service book should prove a worthy companion for the World War II military enthusiast who may have found it both difficult and expensive to ferret out original copies of the series of Technical Manuals pertinent to this model. Post-era Motor Books has assembled them together in this hardbound master volume.

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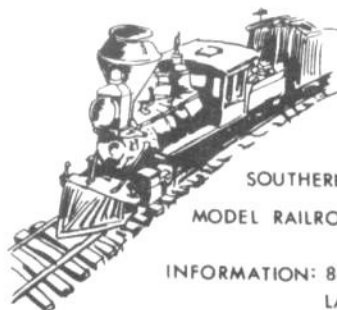
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